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Adirondack

Black Spruce.



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*L. R. Jones.*

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The Forest Commission, State of New York.

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# THE ADIRONDACK BLACK SPRUCE.

BY  
*reeman*  
WILLIAM F. FOX,  
Superintendent State Forests.

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FROM THE ANNUAL REPORT OF THE FOREST COMMISSION FOR 1894.

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ALBANY :  
JAMES B. LYON, PRINTER.  
1895.





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## PREFACE.

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The following article is from a report made to the New York State Forest Commission in 1894. No claim or pretension is made to any original researches of a botanical nature. The report aims rather to furnish information of a general character concerning this, the leading merchantable species in the great forest of Northern New York. At the same time it is hoped that there may be something in these few pages which may be of interest alike to the botanist, forester and lumberman.

WILLIAM F. FOX.

ALBANY, N. Y., *January* 15, 1895.

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# The Adirondack Black Spruce.

PICEA NIGRA, LINK.

BLACK, DOUBLE, OR RED SPEUCE.

Fr., *Epinette noire*;\* Ger., *Schwartztanne*; Sp., *Abeto negro*.

Leaves dark green, needle-shaped, four-sided, about one-half inch in length, and set thickly on all sides of the branches; flowers in May, the cells of the antlers opening lengthwise. Nodding cones, persistent for several years, from one to one and one-half inches long, ovate in shape, recurved, with thin, rigid scales having a characteristic broken or slightly jagged edge, the cones hanging on the end of short branches. Bark thin, of a dark-brown color somewhat tinged with gray, covered with roundish scales.

While the principal habitat of this species is to be found in New York, Vermont, New Hampshire, Maine and Canada, it extends northward to Hudson Bay, and southward as far as North Carolina, although it grows but sparsely in Pennsylvania. It is found also as far west as Wisconsin. Years ago it formed a large part of the forest which covered the Catskill mountains, but was rarely found in the western part of this State.

In New York it attains a common height of 80 feet (24.38 m.), with a common diameter of 18 inches (45.7 cm.); and a maximum height of 105 feet (32 m.), with a maximum diameter of 36 inches (91.4 cm.). It prefers a hilly and mountainous region with an altitude ranging from 1,200 to 1,800 feet, and while it is found at its best on mountain slopes it grows readily in low, swampy valleys.

It furnishes a light softwood of medium strength, with a straight close grain. The heartwood has a tinge of red; it is very often white. The sapwood, which is generally of a lighter shade, or a pure white, is about two inches deep in trees which have attained a diameter of 20 inches or more. The smaller trees have a thicker sap proportionately. It has a specific gravity of 0.534; percentage of ash, 0.27; average tensile strength,

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\* The French Canadians call it *Epinette à la bière*.

10,000 pounds to the square inch. It weighs about 28 pounds to the cubic foot, and when perfectly dry, 25 pounds. Spruce pulpwood cut on high land, partly seasoned, will weigh about 3,800 pounds per cord; that cut on low or swampy land about 4,200 pounds.

It is the leading merchantable species of the New York forests, the white pine having, substantially, been removed many years ago. In 1893 the total product of all the mills which obtained their stock of logs from the Adirondack forests was as follows:

	Feet.
Spruce.....	241,581,824
Hemlock.....	77,910,654
Pine.....	27,844,222
Hardwood.....	7,713,828
Total .....	355,050,528

The production was still greater in 1892, owing to the low water during the previous year; but the figures given here for 1893 will fairly represent the average annual product of this region. In addition to the 241,581,824 feet of spruce sawed in 1893, the pulp mills consumed in that year 92,135,707 feet, B. M., all of which was used in the manufacture of paper.

Spruce lumber is used for various purposes, but principally for house building, a large amount of it being made into flooring and ceiling, for which use it takes the place largely of white pine. A large share of the product is also sawed into joists, scantling, square timber and dimension stuff. In market value it is cheaper than white pine, but dearer than hemlock. The value of the logs in the tree, or "stumpage," is about 35 cents per market log, or \$1.75 per 1,000 feet, the price varying somewhat more or less in proportion as the timber is accessible or within hauling distance of streams which will permit the floating or "driving" of logs to the mills. The value of the logs when delivered on the banks of these streams is about \$1.30 per market, or \$6.50 per 1,000 feet. The bark has no commercial value. It is peeled from standing trees, occasionally by woodmen, guides or sportsmen, who use it for covering the roof or sides of their shanties.

In the Albany lumber market the log run brings about \$14 per 1,000 feet. There is very little clear stuff to be sorted out; a small percentage of clear inch, however, is generally selected which sells for \$23 per 1,000 feet. For this market it is sawed largely into nine inch boards, and into two-inch planks, nine inches wide; also into 2 by 10-inch planks. Shingles made from spruce are of inferior quality, and not durable; hence it is seldom used for this purpose. The wood decays rapidly when exposed to the weather, but when protected it will compare favorably with other softwoods in durability. The trees of this species growing in a dense forest furnish tall tapering trunks, free from branches, with an elastic, straight-grained timber, which makes it very desirable for spars and piles. One firm of lumbermen in the Adirondack region ships annually a large quantity of this timber "in the round," the full length of the tree, for this purpose. It is used in boat building, the base of the tree and principal roots furnishing knees, while the best quality of the straight-grained planks taken from the butt logs are manufactured into oars. In the southern part of the Adirondack forest the best trees are selected, from which the clear butt logs are taken for the manufacture of sounding boards for pianos. Only choice logs are used for this purpose, and these are "quarter sawed" into boards five-eighths of an inch thick. This class of lumber is worth \$35 per 1,000 feet at the mills. The logs cut for this purpose are known in the trade as "fiddle butts."

Mention should be made here, also, of the resinous gum which exudes from the tree trunks of this species, and which, after undergoing a slight preparation, is sold for chewing gum. A large number of men known as gum pickers follow this industry during the winter months, obtaining a good livelihood from this peculiar work. Years ago a favorite drink known as spruce beer was made by boiling the young branches and evaporating the infusion, but its place as a beverage has been so largely taken by other drinks that now one seldom sees or hears of the old-fashioned "spruce beer." This decoction of the spruce twigs has valuable medicinal properties, and is a well-known antidote to the form of scurvy prevalent among seamen while on long voyages.

The wood furnishes an inferior quality of fuel, giving out little heat comparatively, and, owing to the air contained in it, causing

a continual snapping, which makes it dangerous when burned in open fire-places.

Occasionally, this species grows thickly in masses, or what the lumbermen term "clumps," but, as a general thing, it is distributed quite evenly through the forests in which it is found. Throughout the Adirondack woods it forms on an average from 10 to 15 per cent. of the timber. The Adirondack forests, as a whole, are composed principally of hardwoods, the deciduous trees including about 70 per cent., among which the remaining 30 per cent. of conifers are, as a general thing, somewhat evenly distributed. The black spruce is here found in company with the maple, beech, and yellow birch, among which there is a further but small admixture of ash, cherry, elm, basswood, and ironwood. The conifers associated with the spruce are composed of hemlock, balsam (*Abies balsamea*), tamarack and white cedar, the various species of pine having been nearly all removed by the lumbermen years ago. Michaux makes the statement that this species "often constitutes a third part of the forests by which they are uninterruptedly covered." One of our leading text-books on botany states that "dark-mountain forests are often wholly composed of it." While this statement may possibly be true of other localities, there is certainly no such composition in the Adirondack forests, aside from the occasional but small clumps of spruce previously referred to.

In some localities there are large areas along the mountain slopes covered with a heavy proportion of evergreens whose sombre hues might give rise to such an impression to a distant spectator, but a closer examination of such forests discloses a large admixture of other conifers, together with a good proportion of broad-leaved trees which are apparent only in summer, and which even then are liable to be overshadowed and hidden by the overtopping or dominant crowns of tall conifers.

In its habit the black spruce has very little of attraction or beauty in its appearance. When growing in masses, all its branches fall off, leaving groups of columnar, tapering shafts, each of which is surmounted by a small, sparsely-limbed and irregular crown; and this is also the case, to a considerable extent, where it is distributed among the hardwoods with plenty of surrounding space. When growing in openings, well removed







**BLACK SPRUCE.**  
Habit when grown in the Forest.

G. H. Rison, Photo



**BLACK SPRUCE.**  
Habit when grown in the open.

G. H. Rison, Photo.



from other trees, its branches are persistent and cover the trunk from the ground to the crown, forming a pyramidal-shaped tree with a conical head whose regular and symmetrical outlines elicit praise from some, while the primness and exactness of shape is objectionable to others.

In growing it attains height by the annual increase of one leading terminal shoot, which adds to its height 10 to 15 inches each year. From the base of this terminal shoot there is formed each year a whorl of branches which gradually shorten in passing from the lower to the upper ones, the lower ones having each one more year of growth than the one above it. The branches, which are in whorls of four or more, are horizontal with a slight tendency to an upward direction. As the trees increase in age the whorls become less distinct, owing to the decay and falling off of the branches.

The black spruce derives its name from the very dark hue of its foliage which, when massed on some mountain slope, is of such a sombre color that it appears to be black rather than green. The name is also used in distinction from the white spruce, whose leaves are of a pale or glaucous hue. In many of our manuals the black and white spruce are designated respectively as the double and single spruce, but the reason for this peculiar distinction is not readily apparent.

These two species bear such a resemblance that it is not always easy to identify them, the cones, which differ but slightly in size and shape, furnishing the principal distinctive feature when the flowering season has past. The white spruce is far less abundant throughout the Adirondacks, being rarely seen outside of Essex county. It is a much smaller tree, and its branches are more persistent, most of the trees being covered with limbs from the pyramidal apex down to the ground. The difference between these species is best described by Mr. Charles H. Peck, State Botanist, who in referring to their resemblance says:

“The resemblance between the white spruce and some forms of the black spruce is so close that it is not always easy for an unskilled person to separate them. The descriptions of these trees, as given in the manual, indicate but a part of their distinctive features, and the characters there ascribed to the edges of the cone scales do not in all cases hold good. Having compared

these trees at flowering time the following characters seem to me to be the most available ones for distinguishing them.

## WHITE SPRUCE.

Young branchlets glabrous. Leaves six to eight lines long. Cones oblong or cylindrical, deciduous before next flowering time. Sterile aments pale, supported on slender whitish pedicels exerted from the basal cup of scales. Fertile aments eight to ten lines long. Young leaves visible at flowering time.

## BLACK SPRUCE.

Young branchlets pubescent. Leaves four to seven lines long. Cones ovate or oblong, still on the tree at next flowering time. Sterile aments tinged with red, sessile in the basal cup of scales. Fertile aments five to six lines long. Young leaves not yet visible at flowering time.

"These trees are in flower at the same time in the same locality. They were in bloom the past season in the vicinity of Elizabethtown the last week in May."

The white spruce of the Adirondacks seems to be an inferior type of its kind. Prof. Charles S. Sargent, in his "Report on the Forests of North America," tenth United States census, in describing this species says:

"A tree 15 to 50 meters in height, with a trunk 0.60 to 0.90 meter in diameter; low, rather wet soil, borders of ponds and swamps; most common north of the boundary of the United States, and reaching its greatest development along the streams and lakes of the Flathead region of northern Montana, at an elevation of 2,500 to 3,500 feet; the most important timber tree of the American subarctic forests north of the sixtieth degree of latitude, here more generally multiplied and of larger size than the allied *P. Nigra* with which it is associated."

There is also a tree known as the red spruce which is occasionally found in the Adirondacks, but more plentifully in Canada. At one time this tree was described as a distinct species (*Abies rubra*), but latterly it is held to be a variety of the black spruce. It has larger cones, and a reddish, softer wood, the latter feature being attributed by Michaux to some influence of the soil.

Prof. N. L. Britton, of the Department of Botany, Columbia College, in an article on "New or Noteworthy North American Phanerogams"\* says:

"I have lately been much interested in the spruces, and have observed them closely on the Blue Ridge in southwestern Virginia, where I became familiar with two species, one of which I supposed to be the white spruce, *Picea Canadensis*. The same two species occur on the slopes of Mounts Marcy and McIntyre, in the Adirondacks, but neither of them is *P. Canadensis*, which species I did not see. It is reported from northern New York, but I did not encounter it.

\* Bulletin of the Torrey Botanical Club, Vol. 21, No. 1, Jan., 1894.

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*Fig. 1, Cone and leaves natural size.*  
*Fig. 2, A seed.*



*From Michaux's*  
*N. American Sylva.*

**Black Spruce**  
*Picea nigra*

*Albany Eng. Co.*



*Fig.1, Cone and leaves, natural size.  
Fig.2, A seed.*



*From Michaux:  
N. American Sylva.*

White Spruce  
*Picea alba.*

*Albany Eng Co*



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"The two species of the Blue Ridge and the Central Adirondacks are the black spruce, *P. Mariana*, and the red spruce, *P. rubra*. By most recent authors the latter has been regarded as a variety of the former, but this view has been ably attacked by Prof. George Lawson in a paper on 'Remarks on the Distinctive Characters of the Canadian Spruces,' published, I think, in 1888. He there maintains that the red spruce is distinct from the black, and I am in entire accord with this opinion. The white spruce is very different from either of the others by its elongated cones, entirely glabrous and glaucous twigs and sterigmata, and very light-green leaves. *P. rubra* differs from *P. Mariana* by its very slender twigs, which are sparingly pubescent, the sterigmata nearly or quite glabrous, its very slender light-green, nearly straight, very acute leaves, and its oblong cones, which are deciduous at the end of the season, the scales lacerated or two-lobed. *P. Mariana* has stout, very pubescent twigs and sterigmata, stout and thick, merely mucronate, dark-green, incurved leaves, and ovate, larger cones, which are persistent for two or more years, their scales entirely or merely erose. *P. rubra*, according to my observations, reaches a much greater altitude on McIntyre than does *P. Mariana*, and this agrees with our collections in the Blue Ridge of Virginia. The very slender twigs of *P. rubra* and its light-green leaves give it a much more graceful aspect than is exhibited by *P. Mariana*."

A noticeable peculiarity of the Adirondack spruce is the large number of defective trees scattered through the forest, which are known as "seamy trees," this defect or "seam" rendering them unfit for lumber. The seam appears to be a crack which extends up and down the trunk, varying in length and extending in some cases from the butt log to the lower branches of the crown. These openings vary in depth, but sometimes the crack reaches to the heart. The edges of the seam are thickly coated with the resinous substance known as spruce gum, which exudes and then hardens, the larger and cleaner masses being gathered by the "gum pickers" who earn a livelihood by this work. The seams are mostly perpendicular, but in trees where the grain of the wood is not straight, the seam winds upward obliquely as it follows the grain. The cause of this defect has never been satisfactorily explained, although various reasons have been suggested.

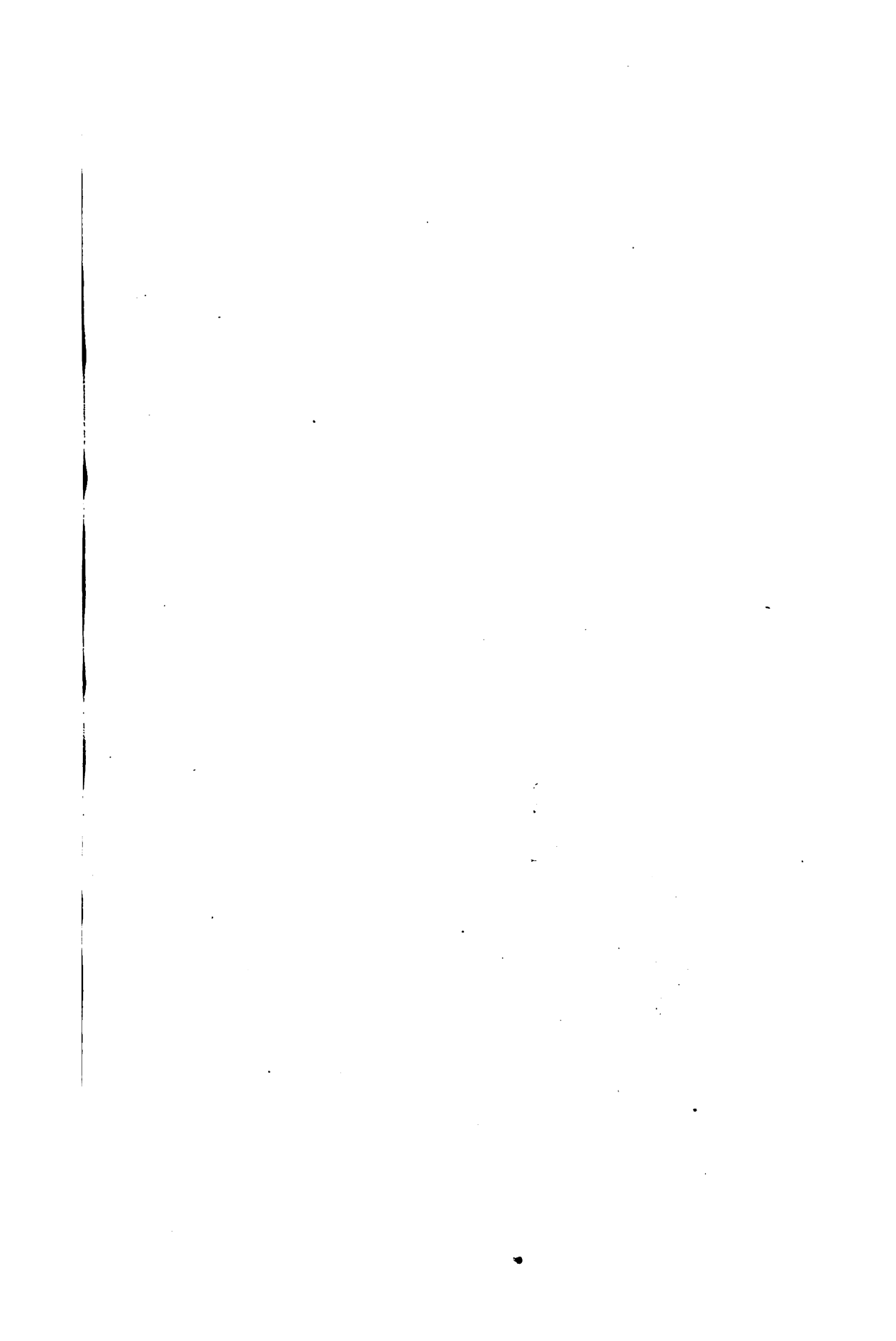
These seamy trees are not as observable now as before the great blight which, within the last 20 years, destroyed a large proportion of the spruce throughout the Adirondack forests. The seams were confined mostly to mature trees, as the

blight seldom attacked trees under 12 inches in diameter. The younger spruces which were spared, and which form a large part of the forest to-day, afford now comparatively few specimens of seamy timber.

About 25 years ago, the black spruce throughout the great forest of northern New York began to show signs of blight, the first appearance of which was noticed in 1868. During the next 10 years this blight spread through most of the forest, only a few localities remaining untouched. Competent authorities who had made a study of the matter on the ground, estimated that at one time one-third to one-half of the matured spruce in the Adirondack region was dead. In some townships there was a recurrence of the evil after an interval of 25 years, the time of the first appearance being fixed by some observers at a date earlier than 1868.

When the trees were first attacked by this scourge, the leaves commenced falling while they were yet green. The foliage remaining on the tree soon turned to a reddish-brown, whose hues made the mountain slopes and forest areas of the valleys appear as if a scorching fire had swept over them. About 1884 there was a noticeable cessation in this destruction of timber, and since that time there has been no recurrence of the evil. The dead trees have mostly fallen, although here and there some tall "stubs" remain as reminders of the calamity. The young trees, which everywhere escaped, now display their green foliage where the brown dead leaves of the blasted spruces were seen, and but little evidence remains of the blight that wrought such a widespread destruction in this class of property.

The cause of this decay or death of the spruce has been the subject of much discussion, various reasons for it having been advanced. Some — among them, men who had been close observers of the blight from its beginning — attributed the death of the trees to drought; but this reason was hardly satisfactory, because the disease killed the timber growing in damp, moist places and swamps, as well as in localities where drought might have affected them; also, on northern as well as on southern slopes. Moreover the alleged drought did not affect in any way the other species, both deciduous and coniferous, which were growing in company with the diseased spruces.





G. H. Rison, Photo

**BRANCH OF THE BLACK SPRUCE**

Not quite natural size.



G. H. Rison, Photo

**BRANCH OF THE BLACK SPRUCE.**

One-third natural size.



Some claimed that this premature decay was due to the agitation of the trees by high winds, but the blight attacked also the timber standing in sheltered and protected situations.

It was suggested that the evil might have been due to a hard winter, to some period of intense cold, or to some late and severe frost occurring after the sap had started in its vernal flow; but there is no record of any such unusual weather, and no reason why all the other species, some of them closely allied to the spruce, should not have been injured by the same cause.

Others, including dendrologists as well as woodsmen, held stoutly to the theory that the spruce was a short-lived species, and that the trees died of old age. There was some ground for this theory in the fact that the smaller trees—those under 12 inches in diameter or thereabouts—were uninjured. But, in reply, it has been shown that the spruce is not a short-lived tree; that it is a hardy species which resists the extremes of altitude and latitude; that, where it grows subject to natural forest conditions, it is the slowest in growth of all the native trees of our State, and that there are live spruces standing in the Adirondacks which are nearly four centuries old. Spruces of equal diameters often vary 100 years in age, owing to difference in environment. But these trees died in masses or clumps, the same as when scattered, irrespective of the fact that, though of equal size, they differed a century or more in age. If the trees which died had all been planted at the same time, were all of the same size, diameter and age, and, furthermore, the limit of maturity had been ascertained and determined, then the theory of death from old age might be entertained.

In view of the prevalence of insect blight elsewhere it seems strange that this cause should have been overlooked or summarily dismissed without consideration. Some investigators asserted that they had looked carefully for insects, both on the leaves and under the bark, and failed to find any. This proves nothing, however; the entomologists found them when they took up the investigation.

From statements made by Mr. Peck, the State Botanist, who first discovered the insect at work, and reports of entomologists whose observations justify his conclusions, there seems to be good ground for attributing the death of the Adirondack spruces



to the work of a small beetle known as the *Hylurgus rufipennis*, Kirby. Mr. Peck found both the mature insect and its larvæ in countless numbers under the bark of the diseased trees. These insects excavate a passage between the bark and the wood, eating away a part of both, and thus, practically, girdling the tree, their numerous galleries forming an intricate network of furrows which traverse the most vital part. Woodsmen are apt to claim that worms or insects are found only in dead or fallen timber, and entomologists have often expressed a doubt as to any borer attacking a live tree. But both Mr. Peck and Dr. Packard, in their investigations of the Adirondack spruce blight, found these beetles in live spruces, trees in which the wood was full of sap and on which the leaves were fresh and green.

Mr. Peck mentions having found dead beetles in a 10-inch tree. In this case the insects had commenced work, but the resin — which is so plentiful in the young spruces — oozed from the wounds, obstructing their passage, and the insects becoming embedded in gum were found dead, each in its furrow. The older and larger trees having less resinous matter, offered no such obstruction, which may account for the fact that only the mature trees perished — a much more plausible theory than the one of old age.

The reason for the sudden cessation of the blight has been a subject of discussion as well as the origin. The complete disappearance of these insects has been attributed, with good reason, to the woodpeckers, which were observed at work in many places, the dead trees having been pecked at by these birds in search of insect food until the bark had turned to a reddish hue.

It is not at all improbable that there may be a recurrence of this blight, and another wholesale destruction of merchantable timber from this cause. If so, the timber as fast as it is attacked should be cut and marketed instead of allowing it to be wasted and lost. Unfortunately the State law will not permit any such economic action. The sale of any timber in the Forest Preserve, not only the matured but the dead and fallen trees as well, is specifically prohibited. Neither can the law be repealed or amended, for the persons who are responsible for this remarkable legislation succeeded in having it incorporated in the Constitution itself.

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G. H. Rison, Photo.

# **BARK ON BLACK SPRUCE.**

Tree 12 inches in diameter.

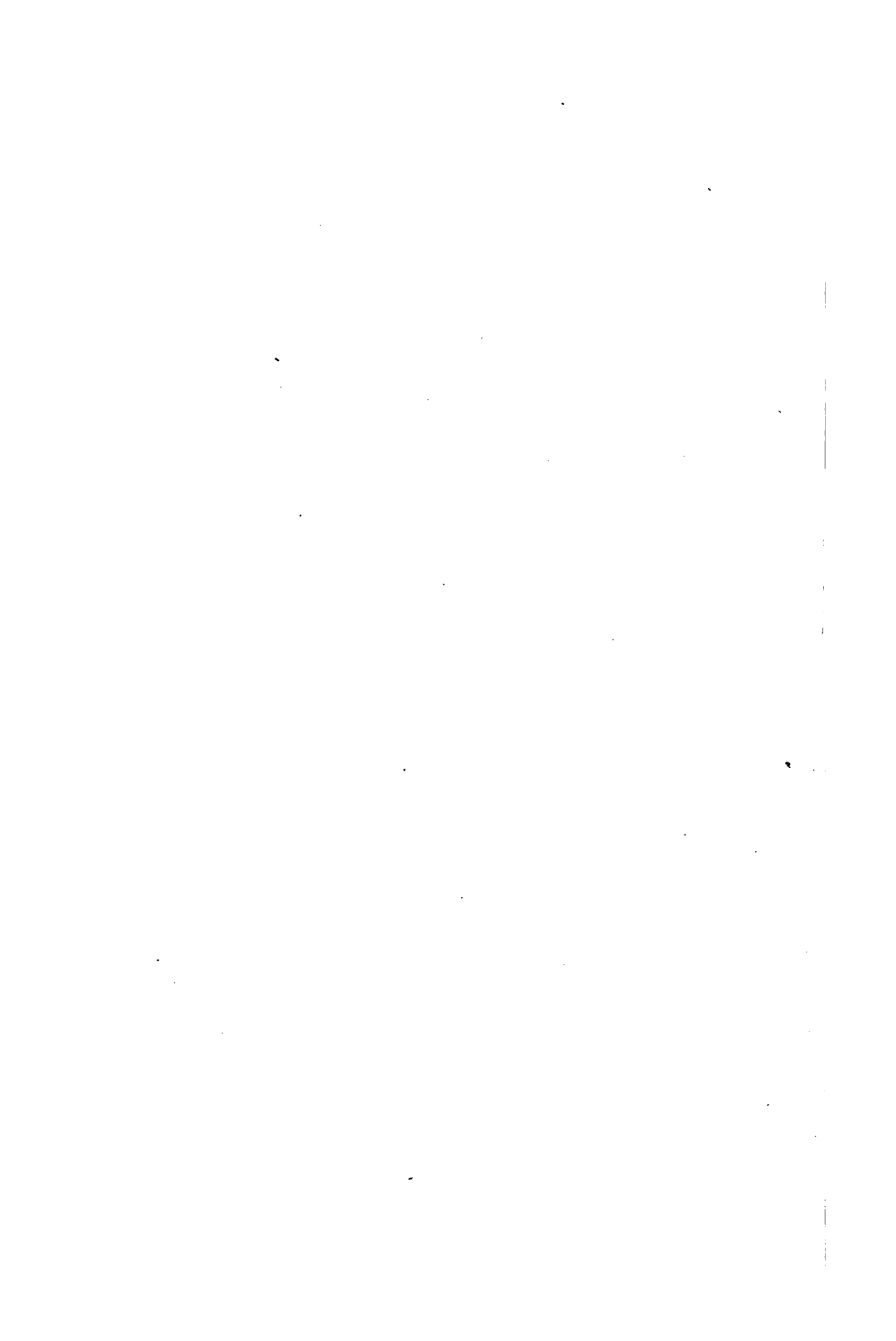


G. H. Rison, Photo

## BARK ON BLACK SPRUCE.

Tree 28 inches in diameter.

NOTE.—Unlike many other species the bark on the large, old trees undergoes little change, and retains its characteristic appearance.



Since the organization of the Forest Commission, 10 years ago, not a tree has been cut on State land with the consent of the Commission, and, under the new Constitution, 20 years must elapse before any such permission can be given. But on the lands owned by the clubs or used as private preserves, which include one-third of the Adirondack forest, timber cutting for revenue and also for forest improvement will always be carried on. Where the cutting is done with reference primarily to forest improvement, the trees are taken irrespective of size or species; but where the thinning is done with reference to forest revenue rather than improvement, the cutting will probably be confined to one or two merchantable species, with some further restrictions to prevent the cutting of small trees or those which have not attained a mature size.

Except in a few localities the hardwood timber, which constitutes over 70 per cent. of the average forest, is not cut, while from the remaining evergreens only two\* species are taken to any extent. There is little or no white pine left in northern New York. Hemlock is valuable only for its bark, owing to the low market price for that kind of lumber, and is not cut for bark except where there is a short haul or easy shipment to some tannery. Balsam, cedar, and tamarack have so small a place in the lumber market that these species are seldom removed. But the black spruce, which forms from 5 to 10 per cent. of our northern forests is a merchantable species in great demand, and forest owners desirous of obtaining a revenue from their property can take the matured trees of this species without any serious injury to existing conditions. In fact, so few spruce trees are cut to the acre on a well-managed job that their absence would be noticed only by those familiar with the business, there being no apparent diminution in the density of the forest or quantity of foliage. Of course, such a system, however closely restricted, would not fill the requirements for forest improvement; but it does not necessarily imply forest injury, much less forest destruction, as recently claimed by some very good but very stupid people.

Laying aside the question of cutting timber with reference to forest improvement, the cutting on the private preserves of

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\* Spruce and hemlock.

matured spruce for revenue only, still involves a discussion of certain points closely connected with forestry principles.

No matter how well our people may become educated in the tenets of scientific forestry, or how amply provided our land-owners may be with skillful, professional foresters, the system under which the Adirondack forest must be managed for years, well or poorly, will be the one known as that of "selection." This is indicated by various conditions. Our forests are already grown, and the market price of their product will not warrant anything in the line of planted forests other than some experimental work. Moreover, as only one merchantable species is accessible, the cutting will be limited for a long time to that one species, — the black spruce. In order to insure a future and permanent supply the selection will be further confined to the matured trees, so far as the problem of tree-growth and interest account will permit.

#### AGE OF THE SPRUCE.

Here arises the question, what constitutes a matured spruce in the Adirondack forests? How old must it be when it grows under natural conditions? How large, how tall, and what must its diameter be? Under any system, whether the thinning be done for improvement or revenue, this point is one of the first to be determined.

For the purpose of obtaining definite information on this subject the Forest Commission instituted some researches, the result of which is here submitted. Acting under definite instructions from the Superintendent some of the foresters, specially detailed for this work, went to different localities in the Adirondack forest, where, by counting the annual rings of tree-growth as revealed by the stumps and cross sections of the trunks, they accumulated a mass of data and statistics which furnish satisfactory information on this point. In counting the rings on the stumps the foresters used large magnifying glasses, which were necessary owing to the slow growth of the spruce and crowded condition of the annual rings. In many cases it would be impossible to count these rings, or "grains" as the woodsmen term them, with the naked eye. The rings were counted on the line of the greatest diameter, and from the center along the longest radiating line. Small pins were inserted at every inch, and the rings in each

inch counted and recorded separately. By the latter arrangement the amount of eccentricity in the growth is apparent in each case. In the black spruce the heart is seldom found in the exact center of the tree, this lack of concentricity in the rings of annual growth being a noticeable feature.

The statistics offered first are based on the work done by Forester Humes, in St. Lawrence county, who examined and counted the rings on 237 spruce trees with reference to establishing the facts as to age and maximum size only. The statistics showing number of years for each successive individual inch of diameter, together with amount of eccentricity, are given in other and subsequent tables.



TABLE I.

SPECIMEN NUMBER.	Diameter of stump, in inches.	Number of rings on stump.	*Length of shaft, in feet.	Diameter at top, in inches.	Number of rings at top.	Total height of tree, in feet.
1 .....	30	325	72	11	98	98
2 .....	30	289	68	9	105	87
3 .....	30	315	54	12	123	82
4 .....	30	275	54	11	104	91
5 .....	30	291	58	12	116	92
6 .....	29	333	58	13	112	81
7 .....	29	298	54	10	100	79
8 .....	29	321	54	9	97	75
9 .....	29	287	58	12	103	87
10 .....	29	312	54	14	138	91
11 .....	29	310	54	13	106	83
12 .....	29	278	54	11	94	80
13 .....	28	278	58	10	100	70
14 .....	28	293	58	13	118	76
15 .....	28	278	54	10	84	70
16 .....	28	247	58	8	99	68
17 .....	28	301	60	7	93	72
18 .....	28	300	54	12	68	70
19 .....	28	271	54	10	123	70
20 .....	27	281	58	12	103	68
21 .....	27	302	54	11	98	76
22 .....	27	298	58	10	99	69
23 .....	27	258	54	9	107	80
24 .....	27	259	54	13	156	78
25 .....	27	316	54	10	121	71
26 .....	27	273	58	11	99	81
27 .....	27	301	54	12	136	69
28 .....	27	298	54	14	134	86
29 .....	27	294	58	12	123	80
30 .....	27	284	58	10	118	71
31 .....	27	294	54	14	119	64
32 .....	27	274	54	11	100	80
33 .....	27	278	58	11	87	67
34 .....	27	304	54	11	101	70
35 .....	27	293	58	11	112	71
36 .....	27	278	54	10	97	68
37 .....	27	301	58	10	80	68
38 .....	26	301	54	13	155	84
39 .....	26	302	58	12	102	74
40 .....	26	293	54	12	138	69
41 .....	26	284	54	13	138	80
42 .....	26	354	65	9	102	94
43 .....	26	291	54	12	129	81
44 .....	26	274	54	13	154	88
45 .....	26	271	54	10	98	80
46 .....	26	235	58	13	123	69
47 .....	26	290	54	10	102	78
48 .....	26	258	54	9	100	80
49 .....	26	291	58	12	91	63
50 .....	26	231	54	10	62	70
51 .....	26	261	54	8	92	80
52 .....	26	293	58	12	102	88
53 .....	25	219	44	10	61	71
54 .....	25	291	58	11	100	81

\* Not including crown or stump. The stumps average 32 inches in height.

TABLE I — (Continued).

SPECIMEN NUMBER.	Diameter of stump, in inches.	Number of rings on stump.	Length of shaft, in feet.	Diameter at top, in inches.	Number of rings at top.	Total height of tree, in feet.
55 .....	25	281	54	11	81	62
56 .....	25	271	54	10	94	80
57 .....	25	219	48	12	99	62
58 .....	25	288	58	10	78	61
59 .....	25	261	54	9	51	78
60 .....	25	300	58	11	91	71
61 .....	25	300	54	11	98	61
62 .....	25	281	57	12	162	71
63 .....	25	300	58	14	152	67
64 .....	25	300	54	11	92	61
65 .....	25	291	54	18	100	62
66 .....	25	195	48	11	76	57
67 .....	25	208	54	8	80	64
68 .....	25	302	58	10	108	71
69 .....	25	271	54	12	94	67
70 .....	25	284	58	18	151	71
71 .....	25	293	54	10	102	71
72 .....	25	273	54	18	108	72
73 .....	25	284	54	9	132	71
74 .....	25	274	58	12	98	61
75 .....	25	281	54	14	152	75
76 .....	25	258	54	11	124	91
77 .....	25	274	58	10	119	83
78 .....	25	271	54	14	120	92
79 .....	25	198	54	10	104	81
80 .....	25	291	56	12	161	91
81 .....	25	267	48	15	126	65
82 .....	24	269	54	14	130	82
83 .....	24	264	54	11	101	71
84 .....	24	274	58	18	121	78
85 .....	24	261	54	11	104	80
86 .....	24	291	58	12	100	69
87 .....	24	272	54	11	98	71
88 .....	24	281	58	12	126	80
89 .....	24	300	62	11	158	86
90 .....	24	271	54	14	132	71
91 .....	24	299	54	18	121	70
92 .....	24	301	58	10	141	80
93 .....	24	291	54	14	132	65
94 .....	24	254	54	11	91	71
95 .....	24	239	54	18	106	61
96 .....	24	267	56	14	123	74
97 .....	24	281	58	12	85	80
98 .....	24	178	54	15	74	68
99 .....	24	267	54	11	124	71
100 .....	24	271	58	13	100	69
101 .....	23	256	54	12	92	67
102 .....	23	300	48	12	120	70
103 .....	23	278	54	11	100	78
104 .....	23	288	55	12	98	71
105 .....	23	291	54	14	141	70
106 .....	23	283	48	11	104	80
107 .....	23	288	58	11	106	73
108 .....	23	300	52	15	151	80

TABLE I—(Continued).

SPECIMEN NUMBER.	Diameter of stump, in inches.	Number of rings on stump.	Length of shaft, in feet.	Diameter at top, in inches.	Number of rings at top.	Total height of tree, in feet.
109 .....	23	291	54	12	108	69
110 .....	23	281	58	11	127	70
111 .....	23	271	54	11	97	69
112 .....	23	217	54	14	85	70
113 .....	23	253	54	13	132	71
114 .....	23	219	54	12	116	62
115 .....	23	271	58	11	121	73
116 .....	23	189	48	10	79	62
117 .....	22	314	54	12	155	73
118 .....	22	263	54	12	152	73
119 .....	22	281	54	13	121	80
120 .....	22	288	54	11	82	76
121 .....	22	261	54	10	99	71
122 .....	22	345	53	9	152	69
123 .....	22	204	54	10	91	70
124 .....	22	215	58	8	100	67
125 .....	22	253	54	11	89	70
126 .....	22	251	54	9	98	71
127 .....	22	261	58	7	80	75
128 .....	22	201	48	9	78	60
129 .....	22	281	54	12	121	64
130 .....	22	107	54	9	91	65
131 .....	22	271	54	8	89	71
132 .....	22	201	54	12	101	67
133 .....	22	265	54	7	97	69
134 .....	22	261	58	11	99	72
135 .....	22	198	54	18	75	64
136 .....	21	256	48	9	100	63
137 .....	21	201	54	8	76	61
138 .....	21	251	48	11	103	73
139 .....	21	251	54	11	99	71
140 .....	21	242	54	18	121	74
141 .....	21	201	48	7	100	71
142 .....	21	199	54	10	78	80
143 .....	21	291	54	14	123	76
144 .....	21	271	56	10	99	70
145 .....	21	286	54	12	100	69
146 .....	21	281	54	10	104	76
147 .....	21	261	54	12	123	80
148 .....	21	271	54	8	100	76
149 .....	21	199	54	11	103	71
150 .....	21	283	58	14	99	81
151 .....	20	200	54	11	101	68
152 .....	20	201	48	9	99	67
153 .....	20	261	54	12	89	70
154 .....	20	206	54	10	99	71
155 .....	20	213	48	11	100	69
156 .....	20	204	54	8	87	72
157 .....	20	208	54	7	82	69
158 .....	20	199	48	9	100	70
159 .....	20	189	54	8	100	78
160 .....	20	201	54	11	102	71
161 .....	20	194	52	9	99	70
162 .....	20	204	48	12	132	60

TABLE I—(Continued).

SPECIMEN NUMBER.	Diameter of stump, in inches.	Number of rings on stump.	Length of shaft, in feet.	Diameter at top, in inches.	Number of rings at top.	Total height of tree, in feet.
163 .....	20	208	54	10	99	68
164 .....	20	207	54	8	124	71
165 .....	20	289	54	10	124	74
166 .....	19	280	46	11	130	78
167 .....	19	198	54	9	105	70
168 .....	19	208	54	8	99	68
169 .....	19	283	62	7	136	82
170 .....	19	194	54	13	100	70
171 .....	19	209	54	10	100	72
172 .....	19	209	48	8	100	67
173 .....	19	238	54	14	96	72
174 .....	19	189	54	12	121	69
175 .....	19	218	48	9	129	74
176 .....	19	201	54	11	99	67
177 .....	19	231	54	6	76	65
178 .....	19	273	58	10	141	76
179 .....	19	194	54	9	100	70
180 .....	19	201	54	10	99	80
181 .....	19	194	56	12	101	71
182 .....	19	204	54	8	78	67
183 .....	19	207	54	11	121	71
184 .....	19	201	48	12	103	69
185 .....	19	184	54	6	78	67
186 .....	19	200	48	5	100	65
187 .....	19	201	54	9	89	70
188 .....	19	199	54	8	89	71
189 .....	18	188	54	7	101	72
190 .....	18	173	46	9	90	70
191 .....	18	200	54	10	100	71
192 .....	18	179	44	8	92	69
193 .....	17	182	46	6	78	65
194 .....	17	200	54	10	89	65
195 .....	17	156	46	8	100	70
196 .....	17	200	48	7	89	67
197 .....	17	192	50	10	102	71
198 .....	17	172	44	6	78	68
199 .....	16	171	50	5	79	66
200 .....	16	200	54	9	121	73
201 .....	16	178	54	8	79	69
202 .....	16	201	50	11	99	70
203 .....	16	167	44	9	100	62
204 .....	15	178	46	10	97	68
205 .....	15	203	42	9	87	71
206 .....	15	174	48	6	78	63
207 .....	15	188	50	5	100	70
208 .....	14	275	27	11	155	74
209 .....	14	182	48	11	108	68
210 .....	14	156	44	7	89	65
211 .....	14	157	44	7	99	69
212 .....	14	200	54	5	78	64
213 .....	14	145	40	8	88	60
214 .....	14	175	50	9	98	70
215 .....	14	161	48	11	103	67
216 .....	14	182	42	12	99	59

TABLE I—(Concluded).

SPECIMEN NUMBER.	Diameter of stump, in inches.	Number of rings on stump.	Length of shaft, in feet.	Diameter at top, in inches	Number of rings at top.	Total height of tree, in feet.
217 .....	18	176	48	4	85	59
218 .....	18	180	36	6	50	61
219 .....	18	157	42	7	60	57
220 .....	18	150	28	8	76	57
221 .....	18	200	44	10	102	66
222 .....	18	188	40	4	59	58
223 .....	18	162	34	6	87	60
224 .....	18	172	27	8	108	61
225 .....	18	192	38	7	96	70
226 .....	18	200	44	9	136	72

Mr. Humes subsequently forwarded some additional notes which are intended to show the maximum size and age of the spruce. Thus far our foresters have been unable to find any black spruce over 36 inches in diameter on the stump. The stumps average about 30 inches in height, and in measuring standing timber the girth is taken at about the same height. The maximum size of the Adirondack black spruce is indicated in the following figures :

TABLE II.

SPECIMEN NUMBER.	Diameter of stump, in inches	Number of rings on stump.	Length of shaft, in feet.	Diameter at top, in inches.	Number of rings at top.	Total height of tree, in feet.
1 .....	36	350	90	12	102	110
2 .....	36	326	84	8	87	90
3 .....	34	302	86	10	100	93
4 .....	34	374	91	5	67	99
5 .....	34	315	72	11	124	87
6 .....	33	285	68	13	165	89
7 .....	32	290	70	5	80	81
8 .....	31	293	60	14	125	80
9 .....	31	231	73	7	80	82
10 .....	31	276	68	10	100	67
11 .....	31	290	71	9	98	70

Statistics showing the age, size or other characteristics of any particular species should be accompanied by some further information regarding the various kinds of trees which are growing on the same ground. To this end Forester Humes, in

accordance with instructions from the Superintendent, measured off a tract of four acres, situated in the forest in which he made the measurements and other memoranda embodied in Tables I and II, and noted all the other trees growing there in company with the spruce. These notes are embodied in Table III. This forest is located in the south part of Township 14 ("Bloomfield"), Town of Fine, St. Lawrence county. It stands on the north slope of a hill, the spruce being thickly interspersed with hardwoods — maple, beech, and yellow birch (*Betula lutea*). The land on which the timber stands has an elevation of about 1,800 feet above the sea.

The four acres which furnish the statistics in the following table represent the maximum yield of spruce per acre, the timber being far above the average in size, height and quantity. The spruce on this piece of four acres — not including trees less than twelve inches in diameter — will yield 60,000 feet of logs, or 15,000 feet to the acre. This is a remarkable exhibit; and, in addition to the spruce, the figures indicate 18,000 feet of hemlock on these four acres, or 4,500 feet per acre. The average quantity of spruce per acre throughout the Adirondack forests, on large tracts, is estimated at 3,000 feet per acre, and some townships have yielded as low as 2,500.

## TABLE III.

## COMPOSITION OF FOREST ON FOUR ACRES.

*S. W.  $\frac{1}{4}$ , Township 14, Town of Fine, St. Lawrence County.*

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Mr. Fremont Fuller, of Duane, Franklin county, N. Y., reports a black spruce, 10 feet 3 inches in circumference, or about 41 inches in diameter, outside the bark, breast high above the ground. This tree, which is sound and healthy, is standing in a clump of spruces with six other large ones near it, and overtops the surrounding forest. It stands on the N. W.  $\frac{1}{4}$  of Township 15, on Lot 3, about two miles from the hotel at Meacham Lake.

TABLE III — (Continued).

DIAMETER— INCHES.	Spruce.	Hemlock.	Maple.	Birch.	Beech.	Total.
24.....	5	2	1	8	.....	11
25.....	4	.....	2	.. ..	.....	6
26.....	6	1	.....	2	.....	9
27.....	4	.....	.....	.....	.....	4
28.....	6	2	.....	.....	.....	8
29.....	2	.....	.....	8	.....	5
30.....	2	.....	.....	1	.....	3
31.....	.....	1	.....	.....	.....	1
32.....	1	2	.....	.....	.....	3
33.....	.....	.....	.....	1	.....	1
34.....	.....	.....	.....	.....	.....	.....
35.....	.....	1	.....	.....	.....	1
36.....	1	1	.....	.....	.....	2
	202	58	81	101	182	574

The average diameters are: Spruce,  $17\frac{1}{2}$  inches; hemlock, 17 inches; maple,  $14\frac{1}{2}$  inches; yellow birch,  $16\frac{1}{2}$  inches, and beech,  $14\frac{1}{2}$  inches. This average does not include trees of less than nine inches in diameter. Number of trees to the acre (nine inches or more in diameter), 144, or less than one to each square rod.\*

The statistics in the next following table are based on measurements and counts made by Foresters Olmsted and Sanford, who were instructed to measure and count the rings of tree growth on 1,000 trees. Of this number the first 700 were examined on Lots 33 and 34, Township 20, Town of Santa Clara, Franklin county. This piece of forest is situated about four miles west of the Upper Saranac lake and lies between Floodwood and Long Ponds.

The 203 specimens next following were examined in St. Lawrence county on Lots 34 and 35, Township 3, Town of Hopkinton.

The remaining 97, embracing specimens 903-1,000, were measured and counted on Lots 50 and 63, Township 3, Town of Hopkinton, St. Lawrence county.

Each locality was covered by a virgin forest, the trees examined being the first that had been cut in that vicinity. The

\* Not including the young trees under nine inches in diameter, of which there was the usual number intermixed with the undergrowth.







**BLACK SPRUCE FOREST.** G. H. Rison, Photo.  
Side-hill growth.

foresters were directed to confine their examinations to trees which were 12 inches or more in diameter on the stump, although the lumbermen were cutting the spruce there as low as 10 inches and occasionally smaller. With the exception of the trees under 12 inches in diameter, the foresters examined every spruce stump and top within the area selected until the required number had been measured.

In counting the rings of growth in these trees note was made of the number at each inch of the radius with a view to determining the annual increase in diameter.

In the following tabulation, Table IV, the first column contains the specimen number, the next the diameter inside the bark of the tree on the stump; then follows the number of rings per inch on the stump, counting from the heart outward, and along the line of what might be termed the longest radius; the last or right-hand column on the left-hand page shows the total number of rings, or age of the tree, as indicated at the height of the stump.

On the right-hand page the statistics for each tree are continued, following the same specimen number, which, as before, is found in the first column; the next column shows the diameter of the shaft at the top, or at the small end of the top log; then come the number of rings per inch at the top, counting outward from the heart; the next column shows the height of the stump; the next the combined length of the logs into which the trunk was cut, each log being as a rule 13 feet 4 inches long; the next shows the length of the tree top or "leader" left by the lumbermen, and the last column the total height of the tree as indicated by the combined figures of the three preceding columns.

The short dash or hyphen-mark, which appears occasionally in connection with the last figure in a line, indicates that the radius terminated in a fractional inch and, consequently, a smaller number of rings.

TABLE IV.

[illegible]

TABLE IV.

SPECIMEN NUMBER. <i>Continued.</i>	Diameter of top in inches.	TOP MEASUREMENTS.										Height of stump.	Combined length of logs.	Length of top.	Total height.	
		Number of rings per inch at top, counting from the heart outward.														
1.	8 1/4	16	15	11	14	10	10					2'	8'	53'	4'	87'
2.	11	12	13	15	18	21	10					3'	4'	26'	8'	72'
3.	10	10	18	26	14	4						3'	0	26'	8'	72'
4.	9	16	16	19	15	13						2'	8	26'	8'	69'
5.	10	12	11	15	16	14	6					2'	8	26'	8'	59'
6.	9	9	9	9	9	9	9					2'	8	26'	8'	55'
7.	8	9	8	7	7	9	9					3'	0	26'	8'	55'
8.	11	21	15	8	10	18	11					2'	4	26'	8'	55'
9.	11	11	18	13	16	12	5					3'	1	40	0	75'
10.	9	14	11	15	13	10	5					3'	0	26'	8'	69'
11.	9	13	14	15	23	6						2'	8	26'	8'	63'
12.	8	10	13	12	11	11	5					2'	8	26'	8'	60'
13.	9	7	8	18	18	8						2'	0	0	0	54'
14.	8	18	23	26	30	...						2'	0	0	0	53'
15.	9	15	16	22	21	...						10'	2	26'	8'	50'
16.	10	12	15	18	19	18						2'	2	26'	8'	46'
17.	10	14	11	12	12	7						2'	6	26'	8'	43'
18.	9	11	18	12	12	13	8					1'	0	26'	8'	43'
19.	9	10	7	13	14	14						3'	4	16	8	41'
20.	8	12	11	13	14	7						3'	4	16	8	41'
21.	9	13	15	9	11	12						3'	4	16	8	41'
22.	9	14	11	13	13	4						3'	2	26'	8'	38'
23.	8	11	13	13	14	7						3'	4	26'	8'	37'
24.	8	13	14	16	12	12						2'	8	26'	8'	36'
25.	8	9	13	15	13	8						3'	0	40	0	34'
26.	9	13	18	12	11	...						2'	8	54	0	34'
27.	8	14	12	11	11	8						2'	0	40	0	30'
28.	10	15	12	13	13	14	11					3'	0	40	0	27'
29.	9	13	15	12	13	13						3'	1	40	0	27'
30.	9	13	14	14	12	12						3'	0	40	0	24'
31.	8	12	13	14	12	7						3'	2	26	8	24'
32.	8	13	14	14	18	...						3'	6	40	0	20'
33.	9	13	12	14	10	12						3'	1	40	0	20'
34.	9	13	16	11	13	...						3'	0	26	8	18'
35.	9	16	14	14	12	11						3'	2	26	8	18'
36.	8	14	12	13	10	...						3'	6	26	8	19'
37.	9	17	14	11	9	13						4'	0	26	8	17'
38.	10	13	18	12	14	11						3'	8	40	0	16'
39.	8	14	14	10	13	...						3'	2	26	8	16'
40.	8	15	16	11	12	...						3'	0	16	8	16'
41.	8	11	13	15	18	...						2'	8	26	8	14'
42.	8	12	10	14	10	...						2'	4	26	8	14'
43.	8	12	15	14	13	...						3'	2	40	0	13'
44.	9	13	12	14	14	6						3'	2	40	0	13'
45.	9	11	13	15	14	8						3'	0	40	0	12'
46.	8	13	13	14	18	...						3'	1	26	8	12'
47.	8	13	12	12	16	...						2'	4	26	8	12'
48.	8	13	13	14	17	...						3'	3	40	0	12'
49.	10	14	14	15	10	11	12					2'	8	26	8	18'
50.	8	12	14	15	12	...						3'	0	40	0	17'
51.	8	14	14	15	15	...						2'	11	26	8	14'
52.	9	11	14	14	12	10						3'	4	26	8	14'
53.	8	16	11	13	15	...						3'	2	40	0	13'
54.	9	13	14	15	13	18						2'	7	40	0	13'
55.	9	14	14	13	14	15						2'	4	26	8	13'
56.	7	12	14	17	12	...						2'	6	26	8	27'
57.	8	15	18	16	17	...						3'	2	26	8	25'
58.	8	12	12	13	13	...						2'	8	40	0	21'
59.	10	15	10	10	14	12	15	18				3'	4	53	4	30'
60.	10	15	12	11	12	10	14	13				3'	2	53	4	34'
61.	8	13	12	13	13	...						2'	4	26	8	24'
62.	9	15	14	14	12	12						2'	4	40	0	35'
63.	8	16	13	12	14	...						2'	6	40	0	33'
64.	10	20	15	16	18	12	7					3'	4	40	0	28'
65.	8	15	14	14	12	...						3'	0	53	4	21'
66.	6	16	12	4	8	...						2'	10	53	4	13'
67.	8	19	16	15	10	...						2'	8	40	0	13'
68.	8	16	16	12	13	13	15					2'	0	26	8	10'
69.	10	18	16	13	15	15	...					3'	8	40	0	32'
70.	9	15	12	17	19	18	...					2'	4	26	8	40'
71.	10	17	18	16	16	12	...					2'	2	26	8	32'

TABLE IV — (Continued).

SPECIMEN NUMBER.	Diameter of stump.	MEASUREMENTS ON STUMP.																				Age in years.
		Number of rings per inch on stump, counting from the heart outward.																				
72	1' 5"	24	24	19	15	12	13	29	8	...	...	...	...	...	...	...	...	...	...	...	...	144
73	1' 4"	23	27	33	19	16	21	21	18	...	...	...	...	...	...	...	...	...	...	...	...	191
74	1' 5"	24	33	35	23	14	15	21	15	21	...	...	...	...	...	...	...	...	...	...	...	208
75	1' 0"	24	23	24	15	14	13	11	...	...	...	...	...	...	...	...	...	...	...	...	...	129
76	1' 1"	26	30	33	29	18	30	8	...	...	...	...	...	...	...	...	...	...	...	...	...	160
77	1' 2"	29	29	24	25	16	13	11	9	6	...	...	...	...	...	...	...	...	...	...	...	161
78	1' 7"	30	17	19	18	15	14	22	24	26	6	...	...	...	...	...	...	...	...	...	...	181
79	1' 5"	43	35	35	13	10	7	14	10	13	...	...	...	...	...	...	...	...	...	...	...	169
80	2' 3"	28	30	17	19	18	15	14	22	24	26	6	...	...	...	...	...	...	...	...	...	186
81	1' 5"	24	31	30	33	16	14	9	12	15	29	...	...	...	...	...	...	...	...	...	...	213
82	1' 6"	23	31	25	21	21	18	16	16	19	8	...	...	...	...	...	...	...	...	...	...	208
83	2' 2"	34	35	18	7	8	30	11	6	10	8	...	...	...	...	...	...	...	...	...	...	217
84	1' 4"	18	28	37	18	16	14	18	22	...	...	...	...	...	...	...	...	...	...	...	...	173
85	1' 6"	33	25	32	36	21	15	5	6	10	9	...	...	...	...	...	...	...	...	...	...	201
86	1' 6"	21	20	19	18	23	24	21	17	18	13	...	...	...	...	...	...	...	...	...	...	205
87	2' 3"	21	22	18	20	14	17	12	18	18	17	...	...	...	...	...	...	...	...	...	...	244
88	1' 1"	26	28	25	14	15	6	12	6	...	...	...	...	...	...	...	...	...	...	...	...	139
89	1' 3"	20	34	20	24	25	12	16	15	...	...	...	...	...	...	...	...	...	...	...	...	166
90	1' 1"	16	28	14	21	24	19	28	28	...	...	...	...	...	...	...	...	...	...	...	...	180
91	1' 2"	24	23	19	18	15	14	18	28	...	...	...	...	...	...	...	...	...	...	...	...	154
92	1' 0"	24	26	27	18	19	16	23	...	...	...	...	...	...	...	...	...	...	...	...	...	153
93	1' 2"	17	28	24	22	10	14	10	17	7	...	...	...	...	...	...	...	...	...	...	...	149
94	1' 3"	24	33	31	17	10	11	9	15	8	...	...	...	...	...	...	...	...	...	...	...	157
95	1' 4"	15	23	30	28	19	10	10	13	14	15	...	...	...	...	...	...	...	...	...	...	176
96	1' 1"	21	19	30	27	30	18	14	...	...	...	...	...	...	...	...	...	...	...	...	...	159
97	1' 1"	24	28	26	19	30	30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	147
98	1' 6"	23	24	21	20	10	18	12	12	27	...	...	...	...	...	...	...	...	...	...	...	161
99	1' 0"	18	22	19	23	16	20	11	...	...	...	...	...	...	...	...	...	...	...	...	...	129
100	1' 6"	18	17	15	13	12	13	12	12	11	18	...	...	...	...	...	...	...	...	...	...	166
101	1' 0"	24	20	20	30	29	19	16	...	...	...	...	...	...	...	...	...	...	...	...	...	142
102	1' 1"	23	26	30	31	21	18	19	14	16	...	...	...	...	...	...	...	...	...	...	...	109
103	1' 2"	22	28	18	13	15	14	18	...	...	...	...	...	...	...	...	...	...	...	...	...	138
104	1' 4"	14	24	18	18	16	16	15	18	8	...	...	...	...	...	...	...	...	...	...	...	145
105	1' 4"	18	22	18	14	14	14	14	18	22	...	...	...	...	...	...	...	...	...	...	...	154
106	1' 0"	24	23	23	30	30	17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	132
107	1' 0"	30	28	17	13	19	28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	130
108	1' 4"	24	23	13	14	18	11	17	15	...	...	...	...	...	...	...	...	...	...	...	...	139
109	1' 1"	28	30	26	27	23	25	15	15	...	...	...	...	...	...	...	...	...	...	...	...	174
110	1' 3"	17	24	23	26	30	30	16	17	23	...	...	...	...	...	...	...	...	...	...	...	173
111	1' 0"	29	21	20	18	18	23	10	...	...	...	...	...	...	...	...	...	...	...	...	...	188
112	1' 4"	18	22	16	17	13	15	8	14	10	...	...	...	...	...	...	...	...	...	...	...	131
113	1' 4"	22	20	18	20	11	17	15	21	...	...	...	...	...	...	...	...	...	...	...	...	144
114	1' 4"	3	32	26	18	15	16	15	16	...	...	...	...	...	...	...	...	...	...	...	...	170
115	1' 2"	20	27	19	18	20	14	15	...	...	...	...	...	...	...	...	...	...	...	...	...	142
116	1' 2"	23	24	24	20	14	12	14	...	...	...	...	...	...	...	...	...	...	...	...	...	181
117	1' 2"	18	28	31	19	14	16	21	...	...	...	...	...	...	...	...	...	...	...	...	...	147
118	1' 4"	23	30	19	23	20	17	23	20	18	...	...	...	...	...	...	...	...	...	...	...	183
119	1' 4"	26	30	19	27	24	26	18	20	19	...	...	...	...	...	...	...	...	...	...	...	200
120	1' 7"	27	31	29	28	17	14	8	8	15	11	...	...	...	...	...	...	...	...	...	...	188
121	1' 6"	22	20	24	26	24	11	11	12	22	...	...	...	...	...	...	...	...	...	...	...	173
122	1' 6"	22	26	23	18	20	16	16	18	16	...	...	...	...	...	...	...	...	...	...	...	175
123	1' 2"	22	21	23	20	19	18	15	17	13	12	...	...	...	...	...	...	...	...	...	...	180
124	1' 0"	26	30	29	20	17	26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	150
125	1' 1"	30	33	28	22	11	30	30	...	...	...	...	...	...	...	...	...	...	...	...	...	173
126	1' 1"	21	26	27	22	17	20	15	14	15	11	...	...	...	...	...	...	...	...	...	...	208
127	1' 0"	24	28	30	14	7	7	8	...	...	...	...	...	...	...	...	...	...	...	...	...	118
128	1' 1"	23	26	25	18	14	18	17	19	...	...	...	...	...	...	...	...	...	...	...	...	160
129	1' 2"	24	20	30	32	17	16	9	11	...	...	...	...	...	...	...	...	...	...	...	...	159
130	1' 4"	18	24	22	10	14	24	26	25	18	18	...	...	...	...	...	...	...	...	...	...	194
131	1' 0"	25	30	20	14	8	13	12	6	...	...	...	...	...	...	...	...	...	...	...	...	181
132	1' 0"	30	34	29	23	11	13	11	6	...	...	...	...	...	...	...	...	...	...	...	...	156
133	1' 0"	32	29	27	11	14	10	10	...	...	...	...	...	...	...	...	...	...	...	...	...	138
134	1' 4"	30	36	26	17	15	9	14	15	12	10	...	...	...	...	...	...	...	...	...	...	184
135	1' 1"	30	38	22	22	23	23	19	8	14	18	...	...	...	...	...	...	...	...	...	...	194
136	1' 1"	38	34	19	19	18	18	18	...	...	...	...	...	...	...	...	...	...	...	...	...	175
137	1' 1"	35	42	35	38	23	8	13	16	...	...	...	...	...	...	...	...	...	...	...	...	210
138	1' 2"	24	27	22	16	16	10	9	8	18	9	...	...	...	...	...	...	...	...	...	...	143
139	1' 2"	20	21	17	15	21	18	12	22	...	...	...	...	...	...	...	...	...	...	...	...	149
140	1' 1"	24	20	22	15	9	10	16	8	...	...	...	...	...	...	...	...	...	...	...	...	116
141	1' 2"	25	27	19	16	18	7	8	14	15	...	...	...	...	...	...	...	...	...	...	...	142
142	1' 1"	30	34	17	30	30	18	19	...	...	...	...	...	...	...	...	...	...	...	...	...	109

TABLE IV — (Continued).

SPECIMEN NUMBER	Diameter of top in inches.	TOP MEASUREMENTS.										Height of stump.	Combined length of logs.	Length of top.	Total height.
		Number of rings per inch at top, counting from the heart outward.													
72.....	11	16	17	19	23	12	9	...	...	...	...	2 5	40 0	36 0	78 8
73.....	8	14	12	16	19	...	...	...	...	...	...	2 6	40 0	41 6	84 0
74.....	10	17	18	18	12	14	...	...	...	...	...	3 0	40 0	23 6	66 6
75.....	8	12	14	14	12	7	...	...	...	...	...	2 4	26 8	33 8	63 8
76.....	9	14	16	16	12	14	...	...	...	...	...	2 3	26 8	34 0	68 8
77.....	11	13	17	15	15	15	...	...	...	...	...	3 0	26 8	43 6	73 2
78.....	8	16	13	17	9	...	...	...	...	...	...	3 1	53 4	23 0	79 5
79.....	8	19	15	11	12	...	...	...	...	...	...	2 4	40 0	26 4	69 8
80.....	10	18	13	12	12	14	...	...	...	...	...	3 0	66 8	24 3	94 4
81.....	8	15	14	15	16	...	...	...	...	...	...	2 3	53 4	25 6	81 6
82.....	10	16	16	15	12	13	...	...	...	...	...	2 10	53 4	29 7	85 9
83.....	8	18	19	10	16	...	...	...	...	...	...	2 8	66 8	15 5	84 9
84.....	9	16	17	11	10	11	...	...	...	...	...	2 4	40 0	34 7	76 11
85.....	8	13	16	12	14	...	...	...	...	...	...	3 0	53 4	21 5	77 9
86.....	9	17	19	11	15	12	...	...	...	...	...	3 1	53 4	21 5	84 9
87.....	12	14	16	16	19	20	24	...	...	...	...	3 2	66 8	23 9	98 7
88.....	8	13	14	12	9	7	...	...	...	...	...	3 0	26 8	30 0	69 8
89.....	11	17	19	13	13	12	14	8	...	...	...	2 10	26 8	33 8	63 2
90.....	9	18	12	17	17	18	...	...	...	...	...	2 9	26 8	37 7	67 0
91.....	8	16	14	12	16	...	...	...	...	...	...	2 6	40 0	28 4	70 10
92.....	8	17	14	12	15	10	...	...	...	...	...	3 1	26 8	34 0	53 9
93.....	8	16	10	14	15	...	...	...	...	...	...	3 4	40 0	27 11	71 3
94.....	9	19	11	12	18	11	...	...	...	...	...	3 1	40 0	31 8	74 9
95.....	10	17	18	12	13	16	...	...	...	...	...	3 0	26 8	34 6	64 2
96.....	8	19	17	14	19	...	...	...	...	...	...	2 8	40 0	26 8	69 4
97.....	10	19	19	11	17	13	...	...	...	...	...	2 9	26 8	31 5	60 10
98.....	8	17	19	15	10	17	...	...	...	...	...	2 11	13 4	24 10	81 1
99.....	8	14	17	14	18	...	...	...	...	...	...	3 0	26 8	23 6	53 2
100.....	7	18	16	10	12	...	...	...	...	...	...	3 10	66 8	16 10	87 4
101.....	8	18	18	12	15	12	...	...	...	...	...	3 2	26 8	36 0	65 10
102.....	7	19	12	14	10	...	...	...	...	...	...	2 6	40 0	24 7	67 1
103.....	9	16	21	13	13	16	...	...	...	...	...	3 1	26 8	26 9	56 6
104.....	10	19	19	12	12	12	16	...	...	...	...	2 8	30 0	37 0	69 8
105.....	11	21	9	13	16	16	19	23	...	...	...	3 3	26 8	38 4	68 3
106.....	8	16	10	14	17	...	...	...	...	...	...	2 10	26 8	37 9	57 3
107.....	8	19	12	13	14	...	...	...	...	...	...	3 0	40 0	21 7	64 7
108.....	8	21	16	9	11	...	...	...	...	...	...	2 4	40 0	28 4	70 8
109.....	8	14	13	17	12	...	...	...	...	...	...	2 8	40 0	30 10	63 6
110.....	8	15	16	19	10	...	...	...	...	...	...	3 0	53 4	21 8	78 0
111.....	7	9	14	17	13	...	...	...	...	...	...	2 2	40 0	27 6	69 8
112.....	7	16	17	12	12	...	...	...	...	...	...	3 2	40 0	34 6	67 10
113.....	9	21	16	13	12	12	...	...	...	...	...	2 0	26 8	39 7	64 3
114.....	6	19	18	10	12	...	...	...	...	...	...	3 0	53 4	21 0	77 4
115.....	8	13	11	15	21	...	...	...	...	...	...	2 4	40 0	27 3	69 7
116.....	8	14	15	17	12	...	...	...	...	...	...	2 2	40 0	27 8	69 10
117.....	9	16	12	13	10	15	...	...	...	...	...	3 4	40 0	25 0	68 4
118.....	7	19	12	16	10	...	...	...	...	...	...	2 7	53 4	19 0	74 11
119.....	11	10	9	15	15	10	17	16	...	...	...	2 8	26 8	41 6	70 10
120.....	7	16	20	15	9	...	...	...	...	...	...	2 4	53 4	17 10	73 6
121.....	5	12	11	16	...	...	...	...	...	...	...	3 3	53 4	29 0	85 7
122.....	8	16	19	12	8	13	...	...	...	...	...	3 0	53 4	18 10	75 2
123.....	9	17	13	14	9	15	...	...	...	...	...	2 6	40 0	26 8	69 2
124.....	9	16	12	14	10	13	...	...	...	...	...	3 4	26 8	31 0	61 0
125.....	9	19	16	12	16	8	...	...	...	...	...	3 3	23 8	37 5	67 4
126.....	11	16	14	10	12	13	16	...	...	...	...	4 0	40 0	31 8	75 8
127.....	8	14	17	11	13	7	...	...	...	...	...	2 2	26 8	27 6	57 4
128.....	8	13	9	19	14	8	...	...	...	...	...	2 10	40 0	26 6	69 4
129.....	9	16	12	14	18	12	...	...	...	...	...	3 0	26 8	36 4	66 0
130.....	11	15	17	14	16	10	9	...	...	...	...	3 2	40 0	37 6	80 8
131.....	9	12	12	17	14	11	...	...	...	...	...	3 0	26 8	23 0	57 8
132.....	8	16	14	15	10	...	...	...	...	...	...	2 10	16 8	37 6	57 0
133.....	8	13	16	12	14	9	...	...	...	...	...	3 1	26 8	25 10	55 7
134.....	10	14	12	16	14	14	...	...	...	...	...	3 4	40 0	19 0	62 4
135.....	6	17	10	12	7	...	...	...	...	...	...	3 1	40 0	18 0	61 1
136.....	8	19	16	18	10	12	...	...	...	...	...	3 0	40 0	29 6	73 6
137.....	7	16	17	15	12	...	...	...	...	...	...	3 4	40 0	23 8	67 0
138.....	8	15	12	15	21	...	...	...	...	...	...	2 10	40 0	26 7	69 5
139.....	9	17	14	13	11	9	...	...	...	...	...	3 0	40 0	23 4	65 4
140.....	8	12	14	16	13	7	...	...	...	...	...	2 8	40 0	26 8	69 4
141.....	9	16	14	14	11	16	...	...	...	...	...	2 10	40 0	29 6	72 4
142.....	8	16	19	14	12	7	...	...	...	...	...	2 10	40 0	30 0	72 10

SPECIMEN NUMBER.	Diameter of stump.	MEASUREMENTS ON STUMP.																		Age in years.
		Number of rings per inch on stump, counting from the heart outward.																		
143.....	1' 1"	80	84	83	85	18	11	11	9										171	
144.....	1' 2"	81	85	86	16	9	14	10	10	6									157	
145.....	1' 1"	81	80	80	16	15	20	21	6										161	
146.....	1' 0"	22	20	29	19	17	15	6											121	
147.....	1' 0"	80	28	26	23	17	19	26											168	
148.....	1' 0"	83	19	14	33	19	16												134	
149.....	1' 0"	16	17	28	14	18	17	14											119	
150.....	1' 3"	24	80	70	21	11	14	15	13										158	
151.....	1' 0"	26	27	24	14	7	17	11											126	
152.....	1' 0"	82	24	23	26	35	18												157	
153.....	1' 0"	24	23	14	14	10	18	11											114	
154.....	1' 2"	26	15	12	6	8	10	13	6										106	
155.....	1' 2"	24	24	16	11	10	7	7	6	6									111	
156.....	1' 2"	25	26	30	23	12	12	8	8	5									148	
157.....	1' 1"	25	18	22	28	18	17	12											140	
158.....	1' 0"	25	27	23	17	16	23												130	
159.....	1' 0"	30	32	34	18	9	9												132	
160.....	1' 0"	18	16	20	14	12	8	10	6										104	
161.....	1' 1"	24	23	19	25	22	7	18	12										150	
162.....	1' 7"	16	16	18	18	12	18	13	14	11	16	20	14						176	
163.....	1' 4"	17	17	17	16	12	19	14	9	8	0								132	
164.....	1' 1"	24	30	26	12	12	13	19	13										149	
165.....	1' 1"	29	28	24	16	13	9	22	11										152	
166.....	1' 4"	24	21	29	16	16	15	17	18										160	
167.....	1' 2"	21	22	15	14	14	8	16	19										129	
168.....	1' 0"	25	36	20	22	24	12	19	19										156	
169.....	1' 2"	24	21	22	10	13	12	18	8										128	
170.....	1' 0"	32	18	18	14	12	21	8											118	
171.....	1' 0"	32	31	26	16	18	9	11											143	
172.....	1' 4"	23	31	22	15	15	16	17	28										167	
173.....	1' 3"	26	30	19	27	18	19	18	9	9									170	
174.....	1' 5"	16	18	15	24	13	11	16	11	16	15								150	
175.....	1' 7"	18	16	15	23	29	23	14	24	11				</						

TABLE IV — (Continued).

SPECIMEN NUMBER.	Diameter of top in inches	TOP MEASUREMENTS.										Height of stump.	Combined length of logs.	Length of top	Total height.	
		Number of rings per inch at top, counting from the heart outward.														
143.....	8	14	11	14	16	6	.....	.....	.....	.....	.....	2' 0"	40'	0"	2' 8"	71' 8"
141.....	9	16	16	12	10	15	.....	.....	.....	.....	.....	2' 4"	26' 8"	33' 4"	62' 4"	
145.....	9	17	11	14	9	15	11	.....	.....	.....	.....	3' 0"	26' 8"	21' 6"	51' 2"	
146.....	8	16	12	12	11	10	.....	.....	.....	.....	.....	3' 0"	26' 8"	3' 4"	61' 0"	
147.....	6	14	17	12	9	.....	.....	.....	.....	.....	.....	3' 6"	40' 0"	8' 8"	52' 2"	
148.....	8	18	16	13	14	7	.....	.....	.....	.....	.....	2' 8"	26' 8"	19' 0"	58' 4"	
149.....	8	16	19	14	14	.....	.....	.....	.....	.....	.....	2' 10"	26' 8"	26' 6"	56' 0"	
150.....	8	19	14	17	12	8	.....	.....	.....	.....	.....	2' 10"	40' 0"	27' 8"	70' 6"	
151.....	8	16	16	16	11	9	.....	.....	.....	.....	.....	2' 8"	26' 8"	25' 0"	54' 4"	
152.....	10	27	24	18	15	18	10	.....	.....	.....	.....	2' 8"	13' 4"	26' 0"	42' 0"	
153.....	8 1/2	19	18	14	10	18	.....	.....	.....	.....	.....	2' 10"	26' 8"	31' 8"	61' 2"	
154.....	8 1/2	14	14	17	21	.....	.....	.....	.....	.....	.....	2' 6"	40' 0"	33' 8"	76' 2"	
155.....	9	15	16	8	11	18	.....	.....	.....	.....	.....	2' 10"	26' 8"	37' 10"	67' 4"	
156.....	8 1/2	16	16	13	12	13	.....	.....	.....	.....	.....	3' 1"	40' 0"	24' 10"	67' 11"	
157.....	9	17	19	12	10	18	.....	.....	.....	.....	.....	3' 3"	26' 8"	40' 6"	70' 5"	
158.....	9	13	19	12	12	16	.....	.....	.....	.....	.....	2' 10"	26' 8"	34' 8"	64' 2"	
159.....	7	16	16	13	11	.....	.....	.....	.....	.....	.....	2' 6"	26' 8"	31' 0"	60' 2"	
160.....	8	16	12	17	12	8	.....	.....	.....	.....	.....	3' 4"	26' 8"	31' 8"	61' 8"	
161.....	7	17	16	10	13	.....	.....	.....	.....	.....	.....	3' 1"	40' 0"	20' 6"	63' 7"	
162.....	7	19	12	16	16	.....	.....	.....	.....	.....	.....	3' 6"	56' 8"	15' 0"	75' 2"	
163.....	9	16	16	12	12	12	.....	.....	.....	.....	.....	3' 0"	40' 0"	24' 6"	67' 6"	
164.....	9	16	19	12	13	8	.....	.....	.....	.....	.....	2' 8"	26' 8"	38' 8"	68' 0"	
165.....	7	7	13	16	16	.....	.....	.....	.....	.....	.....	2' 6"	40' 0"	25' 0"	67' 6"	
166.....	7	13	12	15	15	.....	.....	.....	.....	.....	.....	3' 0"	53' 4"	24' 6"	80' 10"	
167.....	8	16	15	17	14	11	.....	.....	.....	.....	.....	2' 6"	40' 0"	27' 8"	70' 2"	
168.....	9	23	16	16	19	15	.....	.....	.....	.....	.....	2' 6"	26' 8"	33' 0"	62' 2"	
169.....	9	21	17	17	11	13	.....	.....	.....	.....	.....	2' 8"	40' 0"	31' 6"	74' 2"	
170.....	8	16	16	13	13	13	.....	.....	.....	.....	.....	2' 4"	26' 8"	35' 7"	64' 7"	
171.....	8	18	17	11	11	9	.....	.....	.....	.....	.....	2' 7"	26' 8"	27' 10"	57' 1"	
172.....	9	19	19	15	16	8	.....	.....	.....	.....	.....	3' 0"	40' 0"	29' 4"	72' 4"	
173.....	8	16	18	18	12	11	.....	.....	.....	.....	.....	3' 5"	40' 0"	26' 9"	70' 2"	
174.....	14	11	14	10	13	12	15	12	12	.....	.....	2' 11"	26' 8"	42' 8"	72' 3"	
175.....	7	17	11	11	18	.....	.....	.....	.....	.....	.....	2' 8"	66' 8"	25' 0"	94' 4"	
176.....	9	16	17	18	3	12	.....	.....	.....	.....	.....	2' 7"	26' 8"	31' 4"	60' 7"	
177.....	10	18	18	18	10	15	.....	.....	.....	.....	.....	2' 8"	26' 8"	39' 0"	68' 4"	
178.....	7	16	11	14	14	.....	.....	.....	.....	.....	.....	2' 9"	40' 0"	21' 6"	64' 3"	
179.....	7	.....	15	10	17	12	.....	.....	.....	.....	.....	2' 8"	26' 8"	27' 3"	56' 7"	
180.....	7	15	14	16	16	.....	.....	.....	.....	.....	.....	2' 9"	40' 0"	21' 6"	64' 3"	
181.....	8	16	12	11	12	.....	.....	.....	.....	.....	.....	2' 11"	40' 0"	12' 2"	55' 1"	
182.....	9	19	16	12	14	13	.....	.....	.....	.....	.....	2' 7"	26' 8"	30' 0"	59' 3"	
183.....	6	11	11	21	14	12	.....	.....	.....	.....	.....	2' 10"	26' 8"	32' 8"	64' 2"	
184.....	9	16	12	15	11	11	.....	.....	.....	.....	.....	2' 7"	13' 4"	36' 10"	52' 9"	
185.....	8	12	10	17	14	.....	.....	.....	.....	.....	.....	3' 0"	26' 8"	31' 4"	61' 0"	
186.....	8	8	13	11	15	10	.....	.....	.....	.....	.....	2' 7"	26' 8"	30' 8"	59' 11"	
187.....	8	16	14	13	12	.....	.....	.....	.....	.....	.....	3' 0"	26' 8"	30' 0"	59' 8"	
188.....	9	11	12	16	17	.....	.....	.....	.....	.....	.....	2' 6"	26' 8"	26' 5"	55' 7"	
189.....	9	12	16	13	14	.....	11	.....	.....	.....	.....	2' 7"	26' 8"	34' 0"	63' 3"	
190.....	9	13	15	12	11	12	.....	.....	.....	.....	.....	2' 8"	26' 8"	36' 0"	65' 4"	
191.....	9	17	19	8	14	13	.....	.....	.....	.....	.....	3' 4"	53' 4"	26' 9"	83' 5"	
192.....	8	12	16	13	11	14	.....	.....	.....	.....	.....	3' 0"	53' 4"	23' 10"	80' 2"	
193.....	9	10	14	16	12	13	.....	.....	.....	.....	.....	3' 1"	40' 0"	32' 10"	75' 11"	
194.....	8	14	14	13	10	9	.....	.....	.....	.....	.....	2' 6"	26' 8"	29' 0"	58' 2"	
195.....	8	16	17	11	9	8	.....	.....	.....	.....	.....	2' 8"	40' 0"	31' 0"	73' 8"	
196.....	6	18	13	15	9	.....	.....	.....	.....	.....	.....	3' 1"	40' 0"	22' 0"	65' 1"	
197.....	9	20	18	16	11	5	.....	.....	.....	.....	.....	2' 6"	26' 8"	34' 0"	63' 2"	
198.....	8	19	19	12	15	7	.....	.....	.....	.....	.....	2' 8"	26' 8"	27' 6"	66' 10"	
199.....	6	12	15	15	8	.....	.....	.....	.....	.....	.....	2' 10"	53' 4"	19' 0"	75' 2"	
200.....	8	21	16	13	13	.....	.....	.....	.....	.....	.....	3' 1"	40' 0"	27' 4"	70' 5"	
201.....	8	20	19	16	12	7	.....	.....	.....	.....	.....	2' 11"	40' 0"	28' 10"	66' 9"	
202.....	6	15	14	14	13	.....	.....	.....	.....	.....	.....	3' 0"	53' 4"	19' 8"	76' 0"	
203.....	7	17	15	9	17	.....	.....	.....	.....	.....	.....	2' 2"	26' 8"	25' 0"	53' 10"	
204.....	9	21	20	17	12	16	.....	.....	.....	.....	.....	3' 3"	53' 4"	27' 0"	83' 7"	
205.....	7	19	16	12	12	.....	.....	.....	.....	.....	.....	2' 11"	40' 0"	22' 4"	65' 3"	
206.....	9	19	18	20	12	15	.....	.....	.....	.....	.....	2' 8"	16' 8"	39' 0"	68' 4"	
207.....	9	17	18	21	15	16	.....	.....	.....	.....	.....	2' 6"	26' 8"	48' 2"	72' 4"	
208.....	6	17	14	15	16	.....	.....	.....	.....	.....	.....	2' 10"	40' 0"	19' 6"	62' 4"	
209.....	9	19	17	21	12	13	.....	.....	.....	.....	.....	2' 11"	40' 0"	24' 8"	67' 7"	
210.....	10	20	11	8	7	22	24	.....	.....	.....	.....	3' 2"	53' 4"	23' 10"	80' 4"	
211.....	9	19	17	16	15	13	.....	.....	.....	.....	.....	3' 0"	53' 4"	23' 8"	80' 0"	
212.....	9	21	17	12	13	16	.....	.....	.....	.....	.....	3' 6"	40' 0"	31' 7"	75' 1"	
213.....	9	20	20	12	15	17	.....	.....	.....	.....	.....	3' 0"	40' 0"	29' 10"	72' 10"	



TABLE IV — (Continued).

[illegible]

TABLE IV — (Continued).

SPECIMEN NUMBER. <i>Continued.</i>	Diameter of top in inches.	TOP MEASUREMENTS.										Height of stump.	Combined length of logs	Length of top.	Total height.
		Number of rings per inch at top, counting from the heart outward.													
214.....	9	23	17	17	16	12	.....	.....	.....	.....	.....	2' 6"	40' 0"	20' 6"	73' 0"
215.....	9	21	21	16	16	15	.....	.....	.....	.....	.....	3' 0"	40' 0"	33' 10"	76' 10"
216.....	8	19	20	17	13	9	.....	.....	.....	.....	.....	2' 8"	26' 8"	37' 0"	66' 4"
217.....	8	19	17	19	16	.....	.....	.....	.....	.....	.....	3' 0"	40' 0"	23' 4"	65' 4"
218.....	9	19	19	16	16	10	.....	.....	.....	.....	.....	2' 8"	40' 0"	27' 0"	62' 8"
219.....	6	18	16	12	13	.....	.....	.....	.....	.....	.....	3' 1"	53' 4"	23' 0"	78' 5"
220.....	8	19	19	17	15	6	.....	.....	.....	.....	.....	3' 0"	40' 0"	26' 10"	69' 10"
221.....	8	18	19	16	16	10	.....	.....	.....	.....	.....	2' 11"	40' 0"	25' 0"	67' 11"
222.....	8	24	21	19	17	.....	.....	.....	.....	.....	.....	3' 10"	26' 8"	19' 4"	69' 10"
223.....	12	24	24	19	19	19	16	.....	.....	.....	.....	3' 2"	26' 8"	40' 6"	70' 4"
224.....	6	16	15	16	14	.....	.....	.....	.....	.....	.....	2' 8"	40' 0"	19' 7"	62' 3"
225.....	9	20	19	18	17	17	.....	.....	.....	.....	.....	3' 1"	40' 0"	23' 5"	65' 6"
226.....	10	21	2	17	12	13	.....	.....	.....	.....	.....	3' 0"	40' 0"	24' 0"	67' 0"
227.....	10	23	20	20	16	16	.....	.....	.....	.....	.....	3' 6"	53' 4"	26' 7"	82' 5"
228.....	9	20	20	17	18	12	.....	.....	.....	.....	.....	3' 0"	40' 0"	40' 0"	88' 0"
229.....	10	19	19	19	17	14	.....	.....	.....	.....	.....	2' 10"	40' 0"	36' 10"	79' 8"
230.....	10	2	20	17	17	8	.....	.....	.....	.....	.....	2' 3"	53' 4"	32' 8"	89' 3"
231.....	9	19	20	18	17	17	.....	.....	.....	.....	.....	3' 4"	53' 4"	26' 9"	83' 5"
232.....	9	21	20	20	18	16	.....	.....	.....	.....	.....	3' 2"	40' 0"	28' 4"	71' 6"
233.....	7	15	18	10	16	.....	.....	.....	.....	.....	.....	4' 0"	13' 4"	27' 4"	84' 8"
234.....	8	18	18	16	14	8	.....	.....	.....	.....	.....	3' 6"	53' 4"	19' 3"	76' 1"
235.....	8	20	19	19	22	.....	.....	.....	.....	.....	.....	3' 4"	53' 4"	22' 7"	79' 3"
236.....	10	18	19	17	18	16	.....	.....	.....	.....	.....	3' 8"	40' 0"	36' 8"	80' 4"
237.....	8	16	17	19	12	.....	.....	.....	.....	.....	.....	3' 2"	66' 8"	19' 6"	79' 4"
238.....	7	16	16	14	17	.....	.....	.....	.....	.....	.....	2' 10"	13' 4"	23' 7"	79' 9"
239.....	9	19	20	12	14	16	.....	.....	.....	.....	.....	3' 4"	26' 8"	34' 8"	74' 8"
240.....	7	18	17	17	12	.....	.....	.....	.....	.....	.....	3' 0"	40' 0"	23' 7"	66' 7"
241.....	8	16	17	19	18	.....	.....	.....	.....	.....	.....	3' 1"	53' 4"	21' 10"	78' 3"
242.....	8	18	17	16	14	.....	.....	.....	.....	.....	.....	2' 10"	40' 0"	26' 6"	69' 4"
243.....	8	21	19	12	12	10	.....	.....	.....	.....	.....	2' 8"	40' 0"	13' 7"	66' 3"
244.....	8	19	20	20	16	8	.....	.....	.....	.....	.....	2' 10"	33' 8"	37' 0"	73' 0"
245.....	9	22	13	16	18	12	.....	.....	.....	.....	.....	2' 10"	40' 0"	30' 2"	73' 0"
246.....	7	18	19	15	16	.....	.....	.....	.....	.....	.....	2' 6"	40' 0"	21' 0"	63' 6"
247.....	8	16	12	23	15	10	.....	.....	.....	.....	.....	2' 6"	40' 0"	27' 0"	69' 6"
248.....	8	18	18	10	14	6	.....	.....	.....	.....	.....	3' 0"	26' 8"	24' 9"	54' 5"
249.....	8	16	19	19	12	8	.....	.....	.....	.....	.....	2' 11"	53' 4"	25' 8"	81' 11"
250.....	9	12	19	16	19	12	.....	.....	.....	.....	.....	2' 10"	40' 0"	30' 6"	73' 4"
251.....	8	19	12	13	16	7	.....	.....	.....	.....	.....	2' 6"	26' 8"	29' 4"	58' 6"
252.....	7	19	16	15	.....	10	.....	.....	.....	.....	.....	2' 10"	40' 0"	24' 7"	67' 5"
253.....	8	21	20	17	17	13	.....	.....	.....	.....	.....	3' 0"	66' 8"	26' 10"	96' 6"
254.....	10	22	16	12	19	17	.....	.....	.....	.....	.....	2' 10"	40' 0"	34' 8"	77' 6"
255.....	10	19	12	22	18	13	.....	.....	.....	.....	.....	2' 11"	53' 4"	21' 9"	78' 0"
256.....	8	21	16	19	16	9	.....	.....	.....	.....	.....	2' 8"	40' 0"	29' 6"	73' 2"
257.....	7	19	18	14	15	.....	.....	.....	.....	.....	.....	3' 0"	53' 4"	18' 4"	74' 8"
258.....	10	18	22	17	12	16	.....	.....	.....	.....	.....	3' 0"	40' 0"	26' 10"	69' 10"
259.....	10	21	21	14	11	12	.....	.....	.....	.....	.....	3' 2"	40' 0"	27' 4"	70' 6"
260.....	7	16	19	15	12	.....	.....	.....	.....	.....	.....	3' 3"	53' 4"	23' 0"	79' 7"
261.....	8	19	20	17	12	.....	.....	.....	.....	.....	.....	3' 0"	26' 8"	20' 2"	59' 10"
262.....	8 1/2	17	19	16	16	8	.....	.....	.....	.....	.....	3' 1"	26' 8"	31' 0"	60' 9"
263.....	9	21	20	16	14	12	.....	.....	.....	.....	.....	2' 11"	26' 8"	29' 6"	59' 1"
264.....	10	16	15	19	23	17	.....	.....	.....	.....	.....	3' 5"	26' 8"	28' 4"	58' 5"
265.....	9	17	14	11	21	21	.....	.....	.....	.....	.....	2' 8"	40' 0"	29' 7"	73' 3"
266.....	8	19	19	13	18	11	.....	.....	.....	.....	.....	2' 6"	26' 8"	31' 4"	60' 6"
267.....	7	18	10	16	21	.....	.....	.....	.....	.....	.....	2' 8"	40' 0"	21' 0"	63' 8"
268.....	10	21	21	19	11	11	6	.....	.....	.....	.....	3' 0"	26' 8"	29' 8"	59' 4"
269.....	8	16	19	19	17	7	.....	.....	.....	.....	.....	3' 0"	53' 4"	27' 6"	83' 10"
270.....	10	17	22	17	21	10	.....	.....	.....	.....	.....	3' 3"	40' 0"	23' 0"	66' 3"
271.....	8	19	19	12	19	.....	.....	.....	.....	.....	.....	3' 0"	53' 4"	19' 8"	76' 0"
272.....	8	19	14	16	17	8	.....	.....	.....	.....	.....	3' 4"	53' 4"	20' 6"	77' 2"
273.....	7	16	14	16	19	.....	.....	.....	.....	.....	.....	2' 8"	53' 4"	21' 6"	77' 6"
274.....	7	18	17	16	12	.....	.....	.....	.....	.....	.....	3' 6"	53' 4"	24' 4"	81' 2"
275.....	7	16	17	19	16	.....	.....	.....	.....	.....	.....	2' 10"	26' 8"	19' 6"	49' 0"
276.....	8	19	19	12	17	.....	.....	.....	.....	.....	.....	2' 8"	26' 8"	22' 7"	51' 11"
277.....	8	21	19	11	16	7	.....	.....	.....	.....	.....	3' 2"	40' 0"	24' 8"	67' 10"
278.....	8	16	21	21	12	8	.....	.....	.....	.....	.....	3' 0"	40' 0"	21' 8"	64' 8"
279.....	8	13	21	13	19	7	.....	.....	.....	.....	.....	3' 2"	40' 0"	22' 0"	65' 2"
280.....	10	18	22	17	12	19	.....	.....	.....	.....	.....	3' 0"	53' 4"	19' 4"	75' 8"
281.....	10	19	19	21	16	13	.....	.....	.....	.....	.....	2' 10"	40' 0"	27' 6"	70' 4"
282.....	9	16	17	21	13	13	.....	.....	.....	.....	.....	2' 6"	13' 4"	23' 7"	73' 5"
283.....	11	21	19	19	12	13	16	.....	.....	.....	.....	2' 8"	40' 0"	21' 6"	64' 2"
284.....	8	16	19	19	15	6	.....	.....	.....	.....	.....	2' 4"	26' 8"	24' 2"	53' 2"

TABLE IV—(Continued).

SPECIMEN NUMBER.	Diameter of stump.	MEASUREMENTS ON STUMP.																				Age in years.
		Number of rings per inch on stump, counting from the heart outward.																				
285	1' 4"	25	20	18	19	23	30	20	25	...	...	...	...	...	...	...	...	...	...	...	...	183
286	1' 4"	24	24	26	21	15	18	21	18	20	25	...	...	...	...	...	...	...	...	...	...	501
287	1' 4"	23	30	26	16	19	12	11	...	...	...	...	...	...	...	...	...	...	...	...	...	128
288	1' 4"	22	24	30	23	12	13	20	20	6	...	...	...	...	...	...	...	...	...	...	...	128
289	1' 3"	26	22	20	20	16	14	15	24	...	...	...	...	...	...	...	...	...	...	...	...	137
290	1' 10"	20	18	18	18	16	18	14	14	15	14	11	...	...	...	...	...	...	...	...	...	123
291	1' 5"	33	43	21	14	12	14	12	14	16	15	14	11	...	...	...	...	...	...	...	...	191
292	1' 5"	20	26	17	14	16	18	14	16	10	6	...	...	...	...	...	...	...	...	...	...	137
293	1' 0"	81	20	23	25	21	16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	185
294	1' 0"	30	16	18	17	14	18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	113
295	1' 0"	33	30	25	19	18	22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	146
296	1' 1"	19	27	17	30	20	18	30	...	...	...	...	...	...	...	...	...	...	...	...	...	151
297	1' 5"	30	26	20	16	16	26	24	26	16	...	...	...	...	...	...	...	...	...	...	...	189
298	1' 2"	24	21	24	23	15	17	24	18	...	...	...	...	...	...	...	...	...	...	...	...	186
299	1' 0"	20	18	10	18	12	14	12	14	...	...	...	...	...	...	...	...	...	...	...	...	113
300	1' 0"	33	28	22	16	18	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	119
301	1' 1"	27	16	20	12	17	9	7	...	...	...	...	...	...	...	...	...	...	...	...	...	108
302	1' 2"	16	13	13	14	14	15	16	6	...	...	...	...	...	...	...	...	...	...	...	...	106
303	1' 2"	16	18	16	16	13	13	14	9	...	...	...	...	...	...	...	...	...	...	...	...	115
304	1' 2"	21	20	18	17	14	14	15	13	13	13	13	...	...	...	...	...	...	...	...	...	131
305	1' 4"	18	14	18	13	14	8	9	10	12	...	...	...	...	...	...	...	...	...	...	...	116
306	1' 4"	29	34	19	19	10	18	12	4	...	...	...	...	...	...	...	...	...	...	...	...	145
307	1' 1"	30	24	23	15	13	11	19	...	...	...	...	...	...	...	...	...	...	...	...	...	194
308	1' 1"	17	22	16	21	14	10	19	9	...	...	...	...	...	...	...	...	...	...	...	...	128
309	1' 1"	22	18	17	9	10	15	12	...	...	...	...	...	...	...	...	...	...	...	...	...	108
310	1' 1"	26	30	28	16	21	10	8	...	...	...	...	...	...	...	...	...	...	...	...	...	139
311	1' 1"	30	23	34	18	9	20	15	9	...	...	...	...	...	...	...	...	...	...	...	...	148
312	1' 1"	22	26	21	15	7	14	9	...	...	...	...	...	...	...	...	...	...	...	...	...	148
313	1' 0"	22	18	15	14	17	15	15	...	...	...	...	...	...	...	...	...	...	...	...	...	114
314	1' 0"	30	24	14	12	15	8	8	...	...	...	...	...	...	...	...	...	...	...	...	...	101
315	1' 2"	16	21	20	13	11	11	10	16	10	...	...	...	...	...	...	...	...	...	...	...	111
316	2' 0"	24	26	16	12	10	11	9	10	10	10	15	14	14	...	...	...	...	...	...	...	128
317	1' 5"	28	26	24	21	12	7	12	6	8	8	...	...	...	...	...	...	...	...	...	...	181
318	1' 6"	19	27	18	16	16	20	21	19	24	18	15	18	...	...	...	...	...	...	...	...	159
319	1' 6"	24	18	13	12	14	12	13	15	18	...	...	...	...	...	...	...	...	...	...	...	176
320	1' 1"	24	23	24	25	12	13	19	9	...	...	...	...	...	...	...	...	...	...	...	...	139
321	1' 1"	20	18	23	17	11	10	12	...	...	...	...	...	...	...	...	...	...	...	...	...	146
322	1' 0"	27	28	23	17	13	14	13	...	...	...	...	...	...	...	...	...	...	...	...	...	110
323	1' 0"	34	30	24	14	10	6	7	4	...	...	...	...	...	...	...	...	...	...	...	...	134
324	1' 2"	18	26	30	12	11	12	10	20	8	8	...	...	...	...	...	...	...	...	...	...	119
325	1' 0"	26	32	26	11	10	10	10	8	8	...	...	...	...	...	...	...	...	...	...	...	186
326	1' 1"	22	24	17	24	20	14	18	24	...	...	...	...	...	...	...	...	...	...	...	...	141
327	1' 1"	36	33	27	32	26	18	12	...	...	...	...	...	...	...	...	...	...	...	...	...	163
328	1' 10"	18	20	17	13	11	15	13	12	18	13	14	16	...	...	...	...	...	...	...	...	178
329	1' 1"	24	27	18	13	10	14	10	13	12	13	12	...	...	...	...	...	...	...	...	...	163
330	1' 2"	26	30	22	17	12	15	14	12	...	...	...	...	...	...	...	...	...	...	...	...	139
331	1' 0"	22	18	18	15	12	10	8	7	...	...	...	...	...	...	...	...	...	...	...	...	150
332	1' 4"	24	20	13	18	24	27	23	13	...	...	...	...	...	...	...	...	...	...	...	...	110
333	1' 4"	21	20	21	17	17	12	24	17	...	...	...	...	...	...	...	...	...	...	...	...	163
334	1' 4"	22	25	17	15	16	15	18	24	...	...	...	...	...	...	...	...	...	...	...	...	159
335	1' 9"	21	21	13	14	10	13	8	13	10	15	18	...	...	...	...	...	...	...	...	...	166
336	1' 2"	24	15	13	16	17	21	18	...	...	...	...	...	...	...	...	...	...	...	...	...	124
337	1' 2"	30	20	18	18	14	12	12	9	...	...	...	...	...	...	...	...	...	...	...	...	124
338	1' 8"	20	19	17	13	14	13	13	10	12	13	10	13	...	...	...	...	...	...	...	...	133
339	1' 4"	17	22	18	17	14	20	10	9	...	...	...	...	...	...	...	...	...	...	...	...	154
340	1' 2"	15	22	18	14	18	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	127
341	1' 2"	24	30	25	26	17	7	12	20	...	...	...	...	...	...	...	...	...	...	...	...	113
342	1' 6"	21	22	23	27	14	14	11	10	18	7	7	...	...	...	...	...	...	...	...	...	161
343	2' 0"	15	23	18	12	12	12	11	6	7	12	16	10	7	...	...	...	...	...	...	...	174
344	1' 2"	18	24	12	11	15	14	27	...	...	...	...	...	...	...	...	...	...	...	...	...	160
345	1' 5"	24	28	28	21	7	12	8	9	16	13	...	...	...	...	...	...	...	...	...	...	121
346	1' 1"	30	28	24	9	12	15	23	7	...	...	...	...	...	...	...	...	...	...	...	...	166
347	1' 8"	28	17	16	17	18	10	20	28	28	...	...	...	...	...	...	...	...	...	...	...	147
348	1' 10"	23	25	30	28	19	15	18	10	17	13	16	10	...	...	...	...	...	...	...	...	211
349	1' 10"	22	23	24	20	12	13	17	12	12	15	12	...	...	...	...	...	...	...	...	...	224
350	2' 0"	23	36	25	12	10	13	8	10	7	13	10	15	17	17	...	...	...	...	...	...	181
351	1' 0"	30	34	27	24	26	21	33	...	...	...	...	...	...	...	...	...	...	...	...	...	226
352	1' 6"	28	31	33	18	12	14	18	8	16	10	6	...	...	...	...	...	...	...	...	...	185
353	1' 0"	21	23	12	13	18	23	10	...	...	...	...	...	...	...	...	...	...	...	...	...	193
354	1' 0"	23	25	28	14	20	23	15	...	...	...	...	...	...	...	...	...	...	...	...	...	120
355	1' 2"	33	33	23	27	17	3	8	8	9	...	...	...	...	...	...	...	...	...	...	...	151
																					...	164

TABLE IV — (Continued).

SPECIMEN NUMBER <i>Continued.</i>	Diameter of top in inches.	TOP MEASUREMENTS.										Height o stump.	Combined length of logs.	Length of top	Total height.	
		Number of rings per inch at top, counting from the heart outward.														
285.....	8	18	21	17	14	5	.....	.....	.....	.....	.....	2	0	40	65	10
286.....	11	19	20	17	17	18	.....	.....	.....	.....	.....	3	0	40	85	3
287.....	8	14	16	19	19	7	.....	.....	.....	.....	.....	2	10	26	60	8
288.....	11	21	21	18	14	15	.....	.....	.....	.....	.....	3	1	40	29	8
289.....	10	23	17	15	19	17	.....	.....	.....	.....	.....	3	0	40	28	6
290.....	7	12	19	16	16	.....	.....	.....	.....	.....	.....	2	6	40	22	5
291.....	10	17	21	19	17	18	.....	.....	.....	.....	.....	2	4	40	37	7
292.....	8	16	16	20	19	7	.....	.....	.....	.....	.....	3	0	53	42	0
293.....	7	19	18	17	13	.....	.....	.....	.....	.....	.....	2	8	40	15	4
294.....	6	16	14	11	9	.....	.....	.....	.....	.....	.....	3	0	40	20	0
295.....	7	21	21	16	11	.....	.....	.....	.....	.....	.....	3	0	26	28	5
296.....	8	19	16	16	20	7	.....	.....	.....	.....	.....	2	10	26	31	7
297.....	9	20	19	16	13	15	.....	.....	.....	.....	.....	3	1	40	27	6
298.....	8	20	19	12	12	8	.....	.....	.....	.....	.....	2	0	40	21	6
299.....	5	16	17	12	.....	.....	.....	.....	.....	.....	.....	3	2	40	21	7
300.....	6	17	11	16	9	.....	.....	.....	.....	.....	.....	2	8	40	19	10
301.....	7	16	16	17	19	.....	.....	.....	.....	.....	.....	2	6	26	21	4
302.....	8	18	18	19	12	7	.....	.....	.....	.....	.....	3	2	40	22	0
303.....	8	19	17	18	4	.....	.....	.....	.....	.....	.....	3	0	40	26	3
304.....	7	16	19	17	15	.....	.....	.....	.....	.....	.....	3	0	53	18	7
305.....	8	17	17	20	16	9	.....	.....	.....	.....	.....	2	10	40	27	5
306.....	8	18	18	14	19	.....	.....	.....	.....	.....	.....	3	1	26	32	0
307.....	7	17	23	15	16	.....	.....	.....	.....	.....	.....	2	8	40	23	9
308.....	8	19	21	13	17	.....	.....	.....	.....	.....	.....	2	8	40	24	2
309.....	8	18	20	16	16	.....	.....	.....	.....	.....	.....	3	0	26	26	5
310.....	7	16	20	17	14	.....	.....	.....	.....	.....	.....	2	8	40	21	6
311.....	8	22	16	18	17	.....	.....	.....	.....	.....	.....	2	8	40	25	3
312.....	8	19	19	20	16	5	.....	.....	.....	.....	.....	2	4	16	23	0
313.....	9	16	19	20	16	12	.....	.....	.....	.....	.....	2	10	13	44	10
314.....	9	19	17	12	21	8	.....	.....	.....	.....	.....	2	10	13	4	29
315.....	10	16	20	12	14	9	.....	.....	.....	.....	.....	3	4	26	8	6
316.....	11	23	19	20	13	16	9	.....	.....	.....	.....	3	1	53	4	18
317.....	10	16	19	12	21	17	.....	.....	.....	.....	.....	2	10	40	29	8
318.....	8	18	12	17	17	.....	.....	.....	.....	.....	.....	3	1	53	4	21
319.....	10	19	16	13	20	12	.....	.....	.....	.....	.....	3	0	40	24	10
320.....	9	17	16	21	11	7	.....	.....	.....	.....	.....	2	0	26	8	4
321.....	8	20	16	17	12	13	.....	.....	.....	.....	.....	2	4	13	4	39
322.....	8	16	19	10	17	.....	.....	.....	.....	.....	.....	2	4	26	8	0
323.....	10	19	20	21	17	12	15	.....	.....	.....	.....	2	1	13	4	36
324.....	8	16	19	10	16	.....	.....	.....	.....	.....	.....	2	8	40	14	8
325.....	9	19	20	18	16	12	.....	.....	.....	.....	.....	2	4	26	8	9
326.....	9	16	19	18	18	.....	.....	.....	.....	.....	.....	2	1	13	4	28
327.....	7	19	18	18	18	.....	.....	.....	.....	.....	.....	3	0	40	27	0
328.....	8	16	12	15	13	.....	.....	.....	.....	.....	.....	3	4	16	8	2
329.....	8	16	14	14	16	.....	.....	.....	.....	.....	.....	2	8	26	8	8
330.....	9	19	18	20	17	14	.....	.....	.....	.....	.....	2	8	26	8	4
331.....	8	16	18	15	12	7	.....	.....	.....	.....	.....	2	4	40	28	0
332.....	11	19	18	13	17	16	12	.....	.....	.....	.....	3	1	40	30	6
333.....	7	17	16	15	19	.....	.....	.....	.....	.....	.....	2	11	66	15	3
334.....	9	19	19	16	11	14	.....	.....	.....	.....	.....	3	0	40	24	8
335.....	10	19	16	17	14	15	.....	.....	.....	.....	.....	3	2	66	25	6
336.....	8	17	16	15	15	.....	.....	.....	.....	.....	.....	2	10	26	31	4
337.....	9	20	18	16	15	12	.....	.....	.....	.....	.....	2	4	40	34	7
338.....	7	17	19	12	13	.....	.....	.....	.....	.....	.....	2	4	53	4	25
339.....	8	17	16	19	13	7	.....	.....	.....	.....	.....	2	1	40	21	0
340.....	10	16	19	15	12	12	.....	.....	.....	.....	.....	2	0	26	43	8
341.....	9	18	18	17	15	15	.....	.....	.....	.....	.....	2	8	40	33	0
342.....	8	20	19	16	12	7	.....	.....	.....	.....	.....	3	4	53	4	18
343.....	10	18	19	12	11	8	6	.....	.....	.....	.....	3	0	43	4	23
344.....	8	16	19	11	12	8	.....	.....	.....	.....	.....	2	10	48	0	22
345.....	9	19	18	17	11	12	.....	.....	.....	.....	.....	3	1	40	21	9
346.....	7	18	19	21	11	.....	.....	.....	.....	.....	.....	3	4	40	30	0
347.....	8	17	17	10	19	6	.....	.....	.....	.....	.....	3	3	66	18	6
348.....	11	7	15	16	21	24	12	.....	.....	.....	.....	3	2	53	4	26
349.....	11	16	14	14	19	11	8	.....	.....	.....	.....	4	0	53	4	26
350.....	10	11	18	16	18	26	.....	.....	.....	.....	.....	3	10	66	8	0
351.....	8	19	13	15	12	8	.....	.....	.....	.....	.....	2	4	40	27	6
352.....	9	12	19	16	9	15	.....	.....	.....	.....	.....	1	8	53	4	23
353.....	9	16	17	21	12	12	.....	.....	.....	.....	.....	3	0	26	8	0
354.....	8	18	19	20	13	8	.....	.....	.....	.....	.....	2	0	26	8	0
355.....	8	16	20	18	14	6	.....	.....	.....	.....	.....	2	1	40	24	6

TABLE IV—(Continued).

[illegible]

TABLE IV — (Continued).

SPECIMEN NUMBER <i>Continued.</i>	Diameter of top in inches.	TOP MEASUREMENTS.										Height of stump.	Combined length of logs.	Length of top.	Total height.
		Number of rings per inch at top, counting from the heart outward.													
356.....	8	12	22	21	17	10	.....	.....	.....	.....	2' 8"	46' 0"	24' 8"	66' 11"	
357.....	8	16	19	20	30	.....	.....	.....	.....	.....	2' 0"	53' 4"	26' 8"	83' 0"	
358.....	8	17	20	13	15	7	.....	.....	.....	.....	1' 8"	53' 4"	19' 4"	74' 4"	
359.....	8	19	19	12	16	6	.....	.....	.....	.....	2' 0"	53' 4"	24' 0"	79' 4"	
360.....	10	8	18	50	23	19	.....	.....	.....	.....	2' 2"	66' 8"	18' 6"	87' 5"	
361.....	7	16	12	9	14	.....	.....	.....	.....	.....	2' 0"	26' 8"	27' 4"	55' 0"	
362.....	8	17	21	23	11	.....	.....	.....	.....	.....	3' 0"	16' 8"	25' 7"	55' 3"	
363.....	8	21	16	12	12	7	.....	.....	.....	.....	2' 8"	40' 0"	35' 10"	78' 8"	
364.....	11	21	22	17	11	13	9	.....	.....	.....	2' 8"	40' 0"	39' 9"	82' 5"	
365.....	8	16	9	22	13	7	.....	.....	.....	.....	2' 6"	40' 0"	23' 6"	66' 0"	
366.....	9	10	16	23	15	12	.....	.....	.....	.....	2' 4"	53' 4"	21' 0"	76' 8"	
367.....	8	12	19	19	16	6	.....	.....	.....	.....	2' 3"	53' 4"	24' 8"	80' 3"	
368.....	8	17	21	11	18	9	.....	.....	.....	.....	3' 0"	53' 4"	25' 6"	81' 10"	
369.....	9	19	16	21	11	12	.....	.....	.....	.....	2' 8"	26' 8"	26' 0"	55' 4"	
370.....	8	21	11	20	15	10	.....	.....	.....	.....	2' 6"	26' 8"	12' 10"	52' 0"	
371.....	8	6	12	20	27	11	.....	.....	.....	.....	3' 10"	66' 8"	18' 6"	89' 0"	
372.....	11	19	22	21	18	12	11	.....	.....	.....	2' 4"	23' 8"	36' 0"	65' 0"	
373.....	10	16	20	21	19	14	.....	.....	.....	.....	3' 0"	40' 0"	33' 10"	76' 10"	
374.....	9	9	23	17	12	16	.....	.....	.....	.....	2' 10"	40' 0"	22' 6"	65' 4"	
375.....	8	2	12	19	15	.....	.....	.....	.....	.....	2' 8"	53' 4"	22' 0"	78' 0"	
376.....	8	16	19	21	12	8	.....	.....	.....	.....	2' 4"	13' 4"	31' 6"	47' 2"	
377.....	8	17	22	10	12	6	.....	.....	.....	.....	2' 5"	21' 8"	27' 5"	56' 6"	
378.....	10	23	23	27	14	23	.....	.....	.....	.....	2' 0"	26' 8"	17' 4"	66' 0"	
379.....	8	9	21	19	2	7	.....	.....	.....	.....	2' 8"	40' 0"	22' 7"	65' 3"	
380.....	8	12	19	26	15	.....	.....	.....	.....	.....	2' 10"	26' 8"	20' 10"	65' 10"	
381.....	8	20	16	19	13	.....	.....	.....	.....	.....	3' 0"	40' 0"	18' 0"	61' 0"	
382.....	9	20	22	15	17	16	.....	.....	.....	.....	3' 1"	40' 0"	25' 4"	68' 5"	
383.....	11	8	12	8	12	16	18	19	20	.....	2' 8"	40' 0"	42' 6"	83' 2"	
384.....	9	16	20	21	8	18	.....	.....	.....	.....	2' 4"	53' 4"	28' 4"	76' 4"	
385.....	7	8	17	22	11	.....	.....	.....	.....	.....	2' 8"	53' 4"	20' 4"	76' 8"	
386.....	8	17	18	20	19	6	.....	.....	.....	.....	2' 8"	40' 0"	33' 0"	75' 3"	
387.....	8	10	17	13	19	6	.....	.....	.....	.....	2' 6"	40' 0"	15' 8"	58' 2"	
388.....	9	9	16	24	13	12	.....	.....	.....	.....	2' 2"	26' 8"	30' 0"	58' 10"	
389.....	7	7	15	23	21	16	.....	.....	.....	.....	2' 6"	53' 4"	12' 0"	65' 10"	
390.....	10	22	19	23	15	12	.....	.....	.....	.....	3' 0"	40' 0"	24' 4"	77' 4"	
391.....	8	18	21	23	15	9	.....	.....	.....	.....	2' 4"	26' 8"	39' 0"	68' 0"	
392.....	8	13	19	24	12	.....	.....	.....	.....	.....	2' 2"	26' 8"	37' 6"	66' 6"	
393.....	22	21	18	12	14	13	15	18	16	22	28	2' 4"	13' 4"	75' 0"	91' 6"
394.....	9	12	17	23	21	16	.....	.....	.....	.....	2' 4"	40' 0"	33' 0"	75' 4"	
395.....	8	14	16	19	19	10	.....	.....	.....	.....	2' 6"	26' 8"	32' 4"	61' 6"	
396.....	8	10	21	22	12	10	.....	.....	.....	.....	2' 8"	53' 4"	16' 6"	73' 6"	
397.....	10	15	11	23	19	13	.....	.....	.....	.....	2' 9"	53' 4"	24' 8"	82' 9"	
398.....	9	11	.....	21	17	12	9	.....	.....	.....	2' 4"	26' 8"	12' 6"	61' 6"	
399.....	7	16	14	19	17	.....	.....	.....	.....	.....	2' 8"	40' 0"	30' 0"	72' 8"	
400.....	14	14	9	10	12	17	12	13	23	.....	2' 10"	53' 4"	19' 10"	96' 0"	
401.....	9	16	21	23	12	12	.....	.....	.....	.....	2' 8"	40' 0"	31' 0"	73' 8"	
402.....	8	18	17	19	20	.....	.....	.....	.....	.....	2' 0"	23' 8"	27' 6"	57' 2"	
403.....	8	12	19	19	21	9	.....	.....	.....	.....	2' 8"	40' 0"	22' 8"	65' 11"	
404.....	8	17	19	22	18	.....	.....	.....	.....	.....	2' 8"	40' 0"	25' 0"	67' 8"	
405.....	10	9	16	21	23	13	.....	.....	.....	.....	2' 2"	40' 0"	38' 4"	81' 6"	
406.....	10	8	12	16	23	28	27	.....	.....	.....	2' 10"	53' 4"	25' 7"	81' 9"	
407.....	9	21	18	19	23	23	.....	.....	.....	.....	2' 5"	53' 4"	31' 3"	87' 0"	
408.....	9	11	20	21	17	17	.....	.....	.....	.....	2' 6"	53' 4"	24' 4"	80' 2"	
409.....	8	12	17	23	24	9	.....	.....	.....	.....	2' 8"	53' 4"	27' 8"	81' 6"	
410.....	11	11	20	20	19	12	18	.....	.....	.....	2' 8"	40' 0"	26' 7"	82' 9"	
411.....	9	16	18	21	18	23	.....	.....	.....	.....	2' 10"	53' 4"	26' 7"	82' 11"	
412.....	10	12	20	22	18	16	.....	.....	.....	.....	2' 8"	40' 0"	23' 7"	75' 9"	
413.....	8	16	19	17	22	.....	.....	.....	.....	.....	2' 7"	53' 4"	27' 0"	82' 11"	
414.....	7	10	13	19	14	.....	.....	.....	.....	.....	2' 2"	40' 0"	23' 7"	75' 9"	
415.....	9	18	12	23	19	12	.....	.....	.....	.....	2' 2"	40' 0"	32' 8"	74' 10"	
416.....	7	18	21	13	17	.....	.....	.....	.....	.....	2' 6"	40' 0"	18' 6"	71' 0"	
417.....	8	16	14	19	14	.....	.....	.....	.....	.....	2' 5"	40' 0"	26' 10"	69' 3"	
418.....	9	13	21	23	16	9	.....	.....	.....	.....	2' 4"	40' 0"	26' 10"	69' 2"	
419.....	8	16	17	26	17	13	.....	.....	.....	.....	2' 6"	40' 0"	33' 4"	74' 10"	
420.....	9	11	23	26	17	12	.....	.....	.....	.....	2' 3"	40' 0"	31' 0"	73' 8"	
421.....	8	13	19	12	24	.....	.....	.....	.....	.....	2' 2"	26' 8"	30' 3"	59' 1"	
422.....	8	16	9	17	19	6	.....	.....	.....	.....	2' 6"	40' 0"	32' 10"	75' 4"	
423.....	8	12	21	19	21	.....	.....	.....	.....	.....	3' 1"	26' 8"	29' 8"	59' 5"	
424.....	12	16	28	20	23	24	21	.....	.....	.....	3' 10"	13' 4"	53' 8"	69' 10"	
425.....	8	12	16	14	.....	.....	.....	.....	.....	.....	2' 10"	40' 0"	22' 6"	65' 4"	
426.....	8	17	17	22	14	9	.....	.....	.....	.....	2' 11"	26' 8"	29' 6"	59' 1"	

**TABLE IV—(Continued).**

SPECIMEN NUMBER.	Diameter of stump.	MEASUREMENTS ON STUMP.																				Age in years.
		Number of rings per inch on stump, counting from the heart outward.																				
487	1' 0"	18	20	26	28	28	23	19	8													184
488	1' 2"	17	17	20	17	18	10	11	11	8												118
489	1' 0"	16	30	36	18	18	13	18	12													128
490	1' 1"	20	23	28	10	17	19	18	6													122
491	1' 4"	28	17	18	15	8	18	17	13													129
492	1' 5"	25	18	14	18	16	15	19	11	10												141
493	1' 1"	22	15	12	17	27	22	16	16													181
494	1' 3"	20	16	18	17	16	11	18	12													128
495	1' 1"	23	17	15	18	15	17	20	7													126
496	1' 1"	30	20	21	14	14	12	16	20													147
497	1' 0"	14	15	20	24	21	14															108
498	1' 0"	20	22	14	13	12	22		10													113
499	1' 6"	14	14	11	16	12	10	11	12	14	12	11										180
500	1' 1"	26	20	11	11	16	15	18														117
501	1' 4"	14	14	14	16	16	18	15	16	24	9											137
502	1' 6"	19	15	12	14	19	16	15	22	22	24	11										167
503	1' 1"	30	28	28	14	17	15	14		9												148
504	1' 6"	19	19	13	15	12	18	16	15	10	16	16	14	10								174
505	2' 0"	15	19	13	14	12	14	11	13	11	13	12	13	16								163
506	1' 0"	13	18	25	19	22	24	24														156
507	1' 2"	13	18	19	14	18	13	19	23	8												127
508	1' 0"	14	17	16	14	13	17	10	10													101
509	1' 6"	20	19	21	28	17	10	16	17	11	13											173
510	1' 2"	12	13	13	17	18	15	10	10													113
511	1' 6"	16	16	20	20	18	16	14	12	12	20	10										154
512	1' 0"	18	25	23	24	20	20	28														153
513	1' 1"	24	22	22	20	16	32	20	10													124
514	1' 1"	17	17	15	16	15	12	23														114
515	1' 6"	13	17	15	13	14	8	9	18	23	18											147
516	1' 8"	16	16	13	11	12	7	10	9	8												133
517	1' 4"	14	14	13	11	10	14	15	9	15	23	10										124
518	1' 0"	19	17	24	23	21	15	5														124
519	1' 3"	15	14	15	18	17	18	18	16	7												138
520	1' 4"	17	18	13	13	15	18	13	16	23	9											144
521	1' 4"	23	20	15	17	15	15	17	21	19												163
522	1' 6"	20	16	12	14	8	11	12	16	11	23	8										153
523	1' 5"	16	13	17	15	12	17	12	22	13												127
524	1' 2"	19	18	18	20	15	15	17	23	6												153
525	1' 1"	10	17	14	19	19	16	15	9													113
526	1' 2"	18	16	17	16	17	18	12	7													121
527	1' 4"	15	14	14	15	19	12	18	15	13	6											140
528	1' 5"	19	19	16	16	14	9	9	15	23	14											149
529	1' 2"	10	15	15	14	14	15	19	12													124
530	1' 3"	20	25	17	10	12	11	15	26													136
531	1' 4"	20	16	17	12	12	10	27	21	14												143
532	1' 3"	22	22	17	13	11	13	9	8	5												129
533	1' 0"	16	20	19	16	18	21	9														119
534	1' 6"	13	36	16	15	10	13	9	18	30												160
535	1' 6"	14	23	20	14	14	19	11	16	10	11	8										153
536	1' 2"	22	20	24	22	17	18	19	14													156
537	1' 0"	32	24	16	17	13	14	18														134
538	1' 2"	18	22	12	13	10	14	15														104
539	1' 0"	23	22	22	27	19	23															136
540	1' 2"	24	19	15	18	16	16	17	9	7												143
541	1' 2"	30	24	16	13	12	11	9	5													120
542	1' 0"	18	24	17	18	21	22															120
543	1' 0"	18	21	20	23	18	23	13														135
544	1' 4"	26	24	23	14	12	15	10	16	12	5											157
545	1' 1"	27	18	17	17	17	11	10														117
546	1' 1"	18	22	16	14	15	11	10														106
547	1' 2"	24	26	16	15	12	11	9	7	10												130
548	1' 0"	25	20	17	14	14	11	11														112
549	1' 1"	33	30	20	12	10	12	12	6													135
550	1' 1"	27	24	20	15	12	16	19														133
551	1' 0"	27	20	16	21	18	16															123
552	1' 0"	32	30	24	11	16	15															128
553	1' 2"	29	26	19	16	15	16	15	10													146
554	1' 3"	29	29	13	12	12	13	18	19													145
555	1' 1"	17	20	17	13	13	22	18														120
556	1' 4"	26	32	20	17	13	20	14														142
557	1' 1"	26	21	21	16	20	22	13														129

TABLE IV — (Continued).

SPECIMEN NUMBER	Diameter of top in inches.	TOP MEASUREMENTS.										Height of stump.	Combined length of logs.	Length of top.	Total height.
		Number of rings per inch at top, counting from the heart outward.													
427	8	16	19	10	24	12	19					5'	6'	21'	50'
428	10	21	23	10	17	12	19					3'	2'	36	66
429	8	12	16	23	16							2	6	24	63
430	8	19	11	17	12	9						3	0	23	53
431	8	12	20	19	10	14						3	10	40	73
432	10	17	22	20	11	18						4	0	40	82
433	9	20	20	12	14	18						2	6	37	66
434	10	16	24	17	11	16	10					2	10	31	64
435	8	10	17	21	15	12						2	3	29	56
436	8	12	19	20	17							2	8	40	77
437	8	18	12	19	10							2	6	31	60
438	9	16	21	11	23	10						3	0	22	52
439	10	20	19	12	16	16	12					3	4	37	81
440	9	17	17	14	12	17						2	10	33	63
441	8	19	12	21	17	12						3	0	25	77
442	8	13	16	19	19	8						3	0	21	67
443	8	17	22	20	11	16						2	3	26	55
444	11	1	24	19	20	17	10					4	4	34	78
445	12	10	14	14	16	16	14					3	6	34	91
446	8	12	16	12	16							4	2	40	70
447	8	14	20	17	11	10						3	6	40	64
448	8	13	19	17	12	7						3	2	26	56
449	8	9	17	22	15							3	0	27	84
450	8	13	16	16	20	8						4	0	23	67
451	9	16	20	23	19	12						4	8	26	97
452	8	10	14	19	19							2	2	24	53
453	9	12	16	21	17	11						3	0	27	57
454	8	11	13	26	12	5						3	10	24	54
455	12	12	16	9	17	8	15					4	2	40	81
456	11	13	10	14	18	21	8					3	4	40	88
457	8	18	18	19	12	7						4	8	22	80
458	7	13	20	12	15							3	2	26	50
459	8	8	19	19	16							3	2	27	57
460	10	8	21	20	12	19						2	4	40	76
461	10	16	22	18	19	17						3	1	40	78
462	11	14	19	21	21	11	14					4	0	40	81
463	10	11	20	17	19	19						3	4	40	73
464	8	10	17	19	23							2	8	40	64
465	9	16	12	14	20	10						3	0	26	54
466	9	12	19	21	15	14						3	0	40	69
467	10	15	21	12	17	18						3	4	40	71
468	11	14	18	20	12	19	11					2	4	40	75
469	10	16	20	19	17	12						3	0	26	66
470	10	11	18	22	12	18						3	1	40	73
471	8	12	9	20	16	9						3	8	53	80
472	8	11	16	19	23							3	0	40	67
473	7	8	18	18	20							2	2	26	50
474	8	12	19	22	21							3	4	33	80
475	8	16	16	14	21							4	3	26	83
476	7	1	13	19	23							2	10	40	64
477	8	10	16	21	17							3	0	26	59
478	8	12	19	19	10	13						3	6	40	65
479	9	14	14	20	11	13						3	0	26	63
480	9	13	19	9	18	2						3	1	40	74
481	9	12	21	17	16	20						4	4	40	80
482	8	10	17	12	20							2	2	23	49
483	8	13	16	21	12	14						2	4	26	51
484	10	14	19	22	17	11						2	8	40	70
485	9	11	17	20	14	12						2	8	26	69
486	10	16	21	12	13	10						2	10	26	64
487	10	16	20	10	13	11						2	8	26	67
488	9	17	19	15	21	8						2	7	26	59
489	9	14	21	17	16	10						2	2	26	64
490	9	16	17	20	12	13						2	6	26	60
491	8	18	10	19	...							3	0	40	67
492	8	14	16	16	17							2	4	26	58
493	9	16	15	19	11	12						2	2	40	77
494	10	14	18	20	14	9						2	8	40	75
495	10	16	16	19	12	15						2	8	40	78
496	8	16	19	17	13							2	8	49	69
497	10	16	18	18	17	15						3	1	26	67



TABLE IV—(Continued).

SPECIMEN NUMBER.	Diameter of stump.	MEASUREMENTS ON STUMP.																		Age in years.
		Number of rings per inch on stump, counting from the heart outward.																		
496.	1 1	28	14	17	17	14	12	18	18											109
499.	1 0	25	23	19	16	17	17	14	5											114
500.	1 2	31	27	23	19	18	17	15	15											119
501.	1 0	25	28	23	12	16	12	12	7											120
502.	1 0	31	19	18	18	19	17													113
503.	1 4	25	26	20	22	19	18	11	13	14										163
504.	1 2	28	20	18	16	16	20	16	6											140
505.	1 4	24	28	12	12	13	16	15	11	8	7									145
506.	1 4	25	37	18	26	18	15	18	18	18										168
507.	1 3	20	18	21	18	15	17	14	14											187
508.	1 3	23	26	20	18	12	16	8	8	4										185
509.	1 0	20	24	18	26	25	30	7												150
510.	1 2	26	29	18	16	13	14	8	7											181
511.	1 1	23	18	20	16	11	12	7	8	12	7	8	4							149
512.	1 1	25	36	21	18	20	17	20												187
513.	1 4	21	24	18	20	15	16	13	12											140
514.	1 3	22	16	14	13	14	15	14	15	11	11									145
515.	1 0	30	2	28	20	21	12													133
516.	1 0	22	40	30	24	24	12													151
517.	1 4	15	20	31	18	18	11	18	16											143
518.	1 0	24	20	19	20	21	18													122
519.	1 0	32	24	31	21	19	15													145
520.	1 0	29	21	19	19	17	22	11												188
521.	1 0	27	27	23	23	15	18													133
522.	1 4	30	23	20	17	35	11	13	13											161
523.	1 4	24	30	26	11	15	18	17		11	8									152
524.	1 2	16	28	19	12	14	15	13	9	8	6									140
525.	1 1	17	24	26	28	31	12	7												145
526.	1 1	31	23	25	18	10	17	11												180
527.	1 1	31	29	19	16	18	17	12												137
528.	1 4	13	14	22	25	18	19	23	17	7										187
529.	1 0	28	27	30	24	20	14	7												140
530.	1 1	30	16	19	27	24	12	18												136
531.	1 2	27	19	16	15	23	21	19												140
532.	1 0	33	26	19	11	17	18	13												136
533.	1 1	31	26	24	18	26	19	12												158
534.	1 1	23	21	14	18	15	16	12												139
535.	1 1	36	33	18	18	11	16	13												144
536.	1 0	27	21	26	13	18	17													123
537.	1 0	26	22	20	14	16	12													110
538.	1 4	28	16	12	16	20	13	15	10	9										139
539.	1 2	24	20	14	16	11	14	15	27	9										150
540.	1 9	17	14	26	15	13	14	11	14	23	18									165
541.	1 8	31	22	18	16	11	9	12	11	18	20	15								173
542.	1 3	30	18	18	17	14	10	16	14											137
543.	1 3	27	23	14	13	15	16	12	22	8										152
544.	1 1	24	19	13	20	23	21													127
545.	1 3	27	19	16	23	24	17	19	21											127
546.	1 2	30	26	19	12	8	9	19	8											166
547.	1 0	16	18	13	13	12	18													95
548.	1 1	23	19	17	13	14	11	9												105
549.	1 2	33	27	19	12	17	13	10	11											142
550.	1 0	27	16	19	13	12	11	8												106
551.	1 1	24	23	20	16	17	18	12												139
552.	1 3	36	33	20	14	17	26	17	11											174
553.	1 0	24	12	26	12	7	18	17												116
554.																				
555.	1 4	30	30	13	11	14	15	11	21	10										145
556.	1 1	30	21	17	15	17	21	23												124
557.	1 0	21	12	13	16	18														96
558.	1 5	12	14	18	11	14	15	18	14	18										154
559.	1 2	11	16	19	17	18	20	30												131
560.	1 1	28	19	15	17	12	17	14												123
561.	1 10	16	6	5	8	11	13	11	19	12	10	14	16	20	14					168
562.	1 4	20	23	15	12	15	17	9	9	5										126
563.	1 0	14	21	18	14	19	25													111
564.	1 0	21	18	17	17	21	13													107
565.	1 2	16	18	11	15	12	11	16	15											114
566.	1 2	25	19	12	14	9	16	14	7											116
567.	1 2	18	19	10	12	14	16	16	7											113
568.	1 4	16	21	12	10	13	12	14	14	13	6									113

TABLE IV — (Continued).

SPECIMEN NUMBER <i>Continued.</i>	Diameter of top in inches.	TOP MEASUREMENTS.										Height of stump.	Combined length of logs.	Length of top.	Total height.
		Number of rings per inch at top, counting from the heart outward.													
498.....	8	12	20	16	19	.....	.....	.....	.....	.....	.....	2' 8"	26' 5"	3' 7"	60' 11"
499.....	8	10	16	18	21	24	17	12	.....	.....	.....	3' 0"	26' 0"	2' 4"	64' 4"
500.....	11	16	18	21	19	.....	.....	.....	.....	.....	.....	3' 2"	26' 8"	2' 0"	59' 10"
501.....	8	12	16	19	19	.....	.....	.....	.....	.....	.....	3' 2"	26' 8"	2' 5"	65' 2"
502.....	8	16	14	20	16	9	.....	.....	.....	.....	.....	3' 3"	16' 8"	2' 0"	59' 5"
503.....	8	17	19	12	18	10	.....	.....	.....	.....	.....	3' 0"	53' 4"	22' 7"	78' 11"
504.....	10	12	20	17	19	11	.....	.....	.....	.....	.....	3' 2"	40' 0"	31' 10"	75' 0"
505.....	10	16	19	19	12	17	.....	.....	.....	.....	.....	3' 3"	40' 0"	36' 8"	79' 11"
506.....	10	14	14	12	23	20	.....	.....	.....	.....	.....	3' 1"	40' 0"	32' 6"	75' 7"
507.....	10	16	19	18	10	16	.....	.....	.....	.....	.....	2' 10"	26' 8"	4' 3"	70' 9"
508.....	10	17	17	19	23	18	.....	.....	.....	.....	.....	3' 1"	40' 0"	40' 2"	83' 3"
509.....	8	12	19	12	21	.....	.....	.....	.....	.....	.....	3' 6"	40' 0"	36' 6"	79' 0"
510.....	8	16	7	21	20	.....	.....	.....	.....	.....	.....	3' 2"	40' 0"	27' 4"	70' 6"
511.....	12	7	7	11	9	16	13	18	.....	.....	.....	3' 0"	40' 0"	40' 6"	88' 6"
512.....	11	18	20	16	18	18	14	.....	.....	.....	.....	2' 10"	13' 4"	48' 7"	59' 9"
513.....	10	16	20	8	12	17	.....	.....	.....	.....	.....	2' 8"	40' 0"	44' 4"	77' 0"
514.....	8	12	16	19	16	.....	.....	.....	.....	.....	.....	3' 2"	53' 4"	24' 6"	81' 0"
515.....	8	18	18	17	21	.....	.....	.....	.....	.....	.....	2' 6"	26' 8"	21' 5"	50' 7"
516.....	8	10	12	20	12	.....	.....	.....	.....	.....	.....	3' 1"	40' 0"	26' 10"	69' 11"
517.....	9	10	12	14	18	22	.....	.....	.....	.....	.....	3' 4"	40' 0"	31' 7"	74' 11"
518.....	8	10	14	18	18	.....	.....	.....	.....	.....	.....	2' 6"	40' 0"	32' 6"	65' 0"
519.....	8	11	16	16	23	.....	.....	.....	.....	.....	.....	2' 8"	40' 0"	23' 4"	66' 0"
520.....	8	10	17	17	21	.....	.....	.....	.....	.....	.....	3' 0"	40' 0"	23' 7"	66' 7"
521.....	8	13	16	20	20	.....	.....	.....	.....	.....	.....	3' 0"	40' 0"	21' 6"	64' 6"
522.....	7	10	10	13	17	.....	.....	.....	.....	.....	.....	3' 3"	53' 4"	22' 4"	78' 11"
523.....	8	11	16	19	15	.....	.....	.....	.....	.....	.....	4' 0"	53' 4"	30' 0"	87' 4"
524.....	8	12	14	20	20	.....	.....	.....	.....	.....	.....	2' 10"	40' 0"	28' 6"	71' 4"
525.....	10	16	14	15	13	10	.....	.....	.....	.....	.....	3' 2"	26' 8"	41' 7"	71' 5"
526.....	10	14	18	20	12	17	.....	.....	.....	.....	.....	2' 8"	26' 8"	43' 4"	72' 8"
527.....	11	16	16	19	22	15	.....	.....	.....	.....	.....	3' 0"	40' 0"	26' 8"	69' 8"
528.....	9	17	17	21	20	12	.....	.....	.....	.....	.....	2' 8"	26' 8"	31' 0"	60' 4"
529.....	8	18	21	17	18	6	.....	.....	.....	.....	.....	2' 10"	26' 6"	37' 3"	66' 7"
530.....	9	13	19	16	15	11	.....	.....	.....	.....	.....	2' 11"	40' 0"	28' 4"	71' 3"
531.....	10	19	24	18	12	16	.....	.....	.....	.....	.....	3' 4"	40' 0"	20' 6"	73' 10"
532.....	9	18	12	23	19	17	.....	.....	.....	.....	.....	3' 0"	26' 8"	29' 6"	59' 8"
533.....	9	16	16	19	17	20	.....	.....	.....	.....	.....	3' 3"	26' 8"	34' 0"	63' 11"
534.....	9	16	18	22	21	10	.....	.....	.....	.....	.....	4' 0"	40' 0"	31' 6"	75' 6"
535.....	8	14	19	11	23	.....	.....	.....	.....	.....	.....	3' 0"	26' 8"	28' 4"	58' 0"
536.....	9	18	18	16	16	15	.....	.....	.....	.....	.....	2' 10"	26' 8"	39' 0"	68' 6"
537.....	10	16	19	16	18	21	.....	.....	.....	.....	.....	3' 0"	40' 0"	26' 10"	69' 10"
538.....	10	17	18	20	17	18	.....	.....	.....	.....	.....	3' 1"	26' 8"	31' 6"	61' 3"
539.....	8	18	21	21	16	.....	.....	.....	.....	.....	.....	4' 2"	53' 4"	19' 10"	77' 4"
540.....	9	18	19	22	17	17	.....	.....	.....	.....	.....	4' 0"	53' 4"	22' 6"	79' 10"
541.....	8	16	20	21	19	12	.....	.....	.....	.....	.....	3' 4"	40' 0"	36' 4"	79' 8"
542.....	9	17	22	16	23	18	.....	.....	.....	.....	.....	3' 0"	40' 0"	34' 8"	77' 8"
543.....	9	12	17	17	24	11	.....	.....	.....	.....	.....	3' 2"	26' 8"	27' 4"	57' 2"
544.....	9	16	19	12	17	11	.....	.....	.....	.....	.....	3' 7"	26' 8"	31' 5"	61' 8"
545.....	8	19	14	17	12	6	.....	.....	.....	.....	.....	3' 4"	26' 8"	33' 2"	63' 2"
546.....	7	21	17	16	12	9	.....	.....	.....	.....	.....	3' 9"	40' 0"	26' 4"	70' 1"
547.....	11	23	21	16	12	9	6	.....	.....	.....	.....	3' 6"	40' 0"	31' 6"	75' 0"
548.....	10	24	17	11	10	16	.....	.....	.....	.....	.....	3' 1"	53' 4"	27' 4"	88' 9"
549.....	10	12	19	17	8	18	5	.....	.....	.....	.....	3' 8"	40' 0"	31' 7"	75' 3"
550.....	9	14	18	11	19	21	.....	.....	.....	.....	.....	3' 6"	40' 0"	27' 4"	70' 10"
551.....	8	16	17	10	14	7	.....	.....	.....	.....	.....	3' 3"	40' 0"	31' 4"	74' 7"
552.....	8	18	19	21	17	.....	.....	.....	.....	.....	.....	3' 1"	26' 8"	30' 4"	60' 1"
553.....	8	12	16	19	20	8	.....	.....	.....	.....	.....	2' 10"	26' 8"	31' 10"	61' 4"
554.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
555.....	10	17	19	23	19	10	11	.....	.....	.....	.....	2' 10"	40' 0"	31' 0"	75' 10"
556.....	7	16	14	19	22	.....	.....	.....	.....	.....	.....	3' 0"	40' 0"	28' 4"	71' 4"
557.....	8	18	15	17	19	.....	.....	.....	.....	.....	.....	2' 10"	26' 8"	26' 0"	55' 6"
558.....	10	10	12	17	22	20	19	.....	.....	.....	.....	3' 0"	26' 8"	39' 8"	69' 4"
559.....	8	8	10	13	19	12	.....	.....	.....	.....	.....	2' 10"	40' 0"	24' 10"	67' 8"
560.....	8	9	11	19	17	.....	.....	.....	.....	.....	.....	2' 6"	40' 0"	31' 4"	78' 10"
561.....	11	7	10	16	19	22	17	.....	.....	.....	.....	3' 7"	53' 4"	34' 8"	91' 7"
562.....	11	10	14	12	21	21	8	.....	.....	.....	.....	3' 4"	26' 8"	43' 6"	78' 6"
563.....	8	8	13	12	19	18	.....	.....	.....	.....	.....	3' 1"	26' 8"	43' 8"	78' 5"
564.....	8	12	12	9	17	8	.....	.....	.....	.....	.....	2' 8"	23' 8"	28' 4"	57' 8"
565.....	10	10	14	21	20	18	.....	.....	.....	.....	.....	3' 4"	26' 8"	37' 10"	67' 10"
566.....	10	12	12	7	23	16	.....	.....	.....	.....	.....	2' 6"	21' 8"	34' 5"	63' 7"
567.....	11	18	12	21	22	16	16	.....	.....	.....	.....	3' 2"	26' 8"	37' 6"	67' 4"
568.....	12	0	10	17	19	24	17	.....	.....	.....	.....	3' 0"	26' 8"	41' 4"	71' 0"

[illegible]

TABLE IV — (Continued).

SPECIMEN NUMBER <i>Continued.</i>	Diameter of top in inches.	TOP MEASUREMENTS.												Height of stamp.	Combined length of logs.	Length of top.	Total height.
		Number of rings per inch at top, counting from the heart outward.															
566.....	11	7	12	12	16	16	21	18	.....	.....	.....	.....	.....	3 5	40 0	36 10	80 3
570.....	10	10	12	12	21	22	.....	.....	.....	.....	.....	.....	.....	3 4	40 0	28 6	71 10
571.....	10	11	14	12	17	19	.....	.....	.....	.....	.....	.....	.....	4 1	26 8	48 0	73 9
572.....	9	12	17	19	21	23	.....	.....	.....	.....	.....	.....	.....	4 1	40 0	36 2	80 3
573.....	9	12	14	17	19	19	.....	.....	.....	.....	.....	.....	.....	4 2	53 4	27 8	86 2
574.....	8	8	13	16	22	.....	.....	.....	.....	.....	.....	.....	.....	2 10	40 0	21 6	64 4
575.....	9	16	10	10	21	14	11	.....	.....	.....	.....	.....	.....	2 6	26 8	33 6	61 8
576.....	8	11	12	17	21	.....	.....	.....	.....	.....	.....	.....	.....	2 8	40 0	21 0	63 8
577.....	8	12	10	19	10	.....	.....	.....	.....	.....	.....	.....	.....	2 6	26 8	25 4	54 6
578.....	8	16	11	9	9	.....	.....	.....	.....	.....	.....	.....	.....	3 10	40 0	24 6	68 4
579.....	8	12	16	20	13	.....	.....	.....	.....	.....	.....	.....	.....	3 8	40 0	27 0	70 8
580.....	8	13	15	19	16	.....	.....	.....	.....	.....	.....	.....	.....	2 7	40 0	23 4	65 11
581.....	7	14	12	17	17	.....	.....	.....	.....	.....	.....	.....	.....	2 1	40 0	16 3	58 4
582.....	8	8	11	14	19	.....	.....	.....	.....	.....	.....	.....	.....	2 8	53 4	22 6	78 6
583.....	8	10	12	16	10	8	.....	.....	.....	.....	.....	.....	.....	2 6	40 0	23 7	71 1
584.....	8	14	12	17	11	.....	.....	.....	.....	.....	.....	.....	.....	2 9	36 8	24 10	54 3
585.....	10	16	16	19	12	9	.....	.....	.....	.....	.....	.....	.....	3 3	36 8	26 3	56 2
586.....	8	10	12	17	12	.....	.....	.....	.....	.....	.....	.....	.....	4 0	53 4	20 7	77 11
587.....	7	14	11	13	9	.....	.....	.....	.....	.....	.....	.....	.....	3 1	26 8	23 4	52 1
588.....	9	16	20	14	14	12	.....	.....	.....	.....	.....	.....	.....	2 2	26 8	20 7	49 5
589.....	8	17	19	17	16	.....	.....	.....	.....	.....	.....	.....	.....	3 4	40 0	21 4	64 8
590.....	7	16	12	18	13	.....	.....	.....	.....	.....	.....	.....	.....	2 8	40 0	23 4	66 0
591.....	8	13	9	21	17	.....	.....	.....	.....	.....	.....	.....	.....	2 3	40 0	27 6	69 9
592.....	8	13	17	16	16	.....	.....	.....	.....	.....	.....	.....	.....	2 10	40 0	23 4	71 2
593.....	8	8	11	19	12	.....	.....	.....	.....	.....	.....	.....	.....	2 6	53 4	18 8	74 6
594.....	8	12	13	21	11	.....	.....	.....	.....	.....	.....	.....	.....	3 0	53 4	21 4	77 8
595.....	8	12	14	14	19	.....	.....	.....	.....	.....	.....	.....	.....	2 8	16 8	24 7	53 11
596.....	8	14	14	21	20	.....	.....	.....	.....	.....	.....	.....	.....	3 2	40 0	21 6	64 8
597.....	8	14	19	17	14	.....	.....	.....	.....	.....	.....	.....	.....	2 8	40 0	19 8	62 4
598.....	9	12	9	21	12	.....	.....	.....	.....	.....	.....	.....	.....	2 8	26 8	23 3	52 7
599.....	9	11	13	19	16	10	.....	.....	.....	.....	.....	.....	.....	3 1	53 4	27 10	84 3
600.....	8	10	4	23	17	6	.....	.....	.....	.....	.....	.....	.....	4 0	53 4	23 9	81 1
601.....	11	17	16	21	18	12	13	.....	.....	.....	.....	.....	.....	3 6	13 4	48 2	85 0
602.....	8	8	11	17	12	.....	.....	.....	.....	.....	.....	.....	.....	3 2	40 0	21 6	64 8
603.....	8	10	10	14	14	.....	.....	.....	.....	.....	.....	.....	.....	2 6	26 8	27 0	56 2
604.....	8	12	12	12	9	.....	.....	.....	.....	.....	.....	.....	.....	3 0	40 0	28 6	71 6
605.....	8	16	13	10	8	.....	.....	.....	.....	.....	.....	.....	.....	3 1	26 8	30 4	60 1
606.....	8	10	10	16	13	9	.....	.....	.....	.....	.....	.....	.....	2 11	40 0	29 6	72 5
607.....	9	10	13	14	13	13	.....	.....	.....	.....	.....	.....	.....	3 3	40 0	30 4	73 7
608.....	9	11	13	16	13	15	.....	.....	.....	.....	.....	.....	.....	2 4	26 8	27 6	56 6
609.....	8	11	12	14	16	.....	.....	.....	.....	.....	.....	.....	.....	3 6	40 0	21 4	64 10
610.....	9	13	12	17	17	19	.....	.....	.....	.....	.....	.....	.....	2 2	40 0	26 6	69 8
611.....	10	12	14	16	16	10	.....	.....	.....	.....	.....	.....	.....	2 10	26 8	30 4	79 10
612.....	8	12	9	14	17	.....	.....	.....	.....	.....	.....	.....	.....	3 1	40 0	23 6	66 7
613.....	8	8	11	16	12	.....	.....	.....	.....	.....	.....	.....	.....	2 11	26 8	21 9	51 4
614.....	8	9	9	23	11	.....	.....	.....	.....	.....	.....	.....	.....	2 7	40 0	19 8	62 3
615.....	8	8	14	16	16	.....	.....	.....	.....	.....	.....	.....	.....	3 4	40 0	25 10	69 2
616.....	9	12	14	16	21	12	.....	.....	.....	.....	.....	.....	.....	2 8	53 4	22 3	78 3
617.....	11	15	15	11	14	16	14	9	.....	.....	.....	.....	.....	3 9	26 8	38 10	68 6
618.....	10	16	17	14	14	12	.....	.....	.....	.....	.....	.....	.....	3 2	40 0	34 11	78 1
619.....	10	16	18	11	10	14	.....	.....	.....	.....	.....	.....	.....	2 8	40 0	28 8	71 4
620.....	8	14	14	16	15	.....	.....	.....	.....	.....	.....	.....	.....	2 10	53 4	25 10	83 0
621.....	8	9	11	17	16	.....	.....	.....	.....	.....	.....	.....	.....	2 9	26 8	30 0	59 5
622.....	8	10	13	16	13	.....	.....	.....	.....	.....	.....	.....	.....	3 0	26 8	33 3	61 11
623.....	8	10	11	20	16	.....	.....	.....	.....	.....	.....	.....	.....	2 10	26 8	31 7	61 1
624.....	8	11	11	17	17	.....	.....	.....	.....	.....	.....	.....	.....	2 10	26 8	30 0	59 6
625.....	8	10	17	19	16	.....	.....	.....	.....	.....	.....	.....	.....	2 9	26 8	30 4	59 9
626.....	10	11	10	16	15	17	.....	.....	.....	.....	.....	.....	.....	3 2	26 8	27 8	57 6
627.....	8	11	12	12	14	8	.....	.....	.....	.....	.....	.....	.....	3 0	40 0	32 0	75 0
628.....	8	13	11	16	15	.....	.....	.....	.....	.....	.....	.....	.....	2 8	40 0	32 6	75 2
629.....	8	14	12	12	14	.....	.....	.....	.....	.....	.....	.....	.....	3 0	26 8	34 8	64 4
630.....	8	9	11	17	12	.....	.....	.....	.....	.....	.....	.....	.....	2 4	26 8	27 6	52 6
631.....	10	8	10	11	15	16	.....	.....	.....	.....	.....	.....	.....	3 10	26 8	36 4	66 10
632.....	8 1/2	11	14	13	11	17	.....	.....	.....	.....	.....	.....	.....	3 2	40 0	31 3	74 5
633.....	8	11	11	15	15	7	.....	.....	.....	.....	.....	.....	.....	2 10	40 0	27 6	70 4
634.....	10	10	12	16	19	10	.....	.....	.....	.....	.....	.....	.....	2 8	40 0	34 4	77 0
635.....	8	10	12	14	17	.....	.....	.....	.....	.....	.....	.....	.....	2 10	40 0	26 10	69 8
636.....	8	10	10	16	16	.....	.....	.....	.....	.....	.....	.....	.....	3 0	53 4	21 6	77 10
637.....	8	13	16	19	12	.....	.....	.....	.....	.....	.....	.....	.....	2 8	40 0	24 10	67 6
638.....	10	12	17	17	14	12	.....	.....	.....	.....	.....	.....	.....	2 8	40 0	36 7	79 3
639.....	10	16	19	12	16	8	7	.....	.....	.....	.....	.....	.....	4 0	53 4	33 0	90 4

TABLE IV—(Continued).

SPECIMEN NUMBER.	Diameter of stump.	MEASUREMENTS ON STUMP.																				Age in years.
		Number of rings per inch on stump, counting from the heart outward.																				
640	1' 2'	14	20	23	23	18	20	28	...	...	...	...	...	...	...	...	...	...	...	...	...	145
641	1 2	16	12	14	14	20	20	16	14	...	...	...	...	...	...	...	...	...	...	...	...	126
642	1 4	15	16	15	18	13	16	16	14	8	...	...	...	...	...	...	...	...	...	...	...	131
643	2 0	8	7	7	8	8	12	13	15	17	14	19	22	22	...	...	...	...	...	...	...	145
644	1 6	14	8	9	14	12	12	11	17	20	18	10	...	...	...	...	...	...	...	...	...	187
645	1 6	15	9	8	15	16	15	13	16	24	28	...	...	...	...	...	...	...	...	...	...	166
646	1 4	12	9	10	15	14	15	19	23	24	15	...	...	...	...	...	...	...	...	...	...	157
647	1 4	14	9	10	16	20	18	19	23	30	...	...	...	...	...	...	...	...	...	...	...	168
648	1 6	16	11	10	19	15	16	16	19	25	16	...	...	...	...	...	...	...	...	...	...	163
649	1 4	15	12	12	14	16	21	23	20	...	...	...	...	...	...	...	...	...	...	...	...	142
650	1 6	12	13	19	14	10	14	23	20	21	...	...	...	...	...	...	...	...	...	...	...	135
651	1 0	16	17	18	16	16	15	18	...	...	...	...	...	...	...	...	...	...	...	...	...	98
652	1 2	14	22	20	15	12	13	18	9	25	...	...	...	...	...	...	...	...	...	...	...	132
653	1 3	10	13	25	9	8	16	15	25	25	...	...	...	...	...	...	...	...	...	...	...	146
654	1 4	10	5	7	11	17	12	16	14	31	11	...	...	...	...	...	...	...	...	...	...	134
655	1 0	20	24	21	18	17	19	17	...	...	...	...	...	...	...	...	...	...	...	...	...	119
656	1 0	27	15	20	19	18	19	17	...	...	...	...	...	...	...	...	...	...	...	...	...	135
657	1 0	25	20	21	18	16	14	17	7	...	...	...	...	...	...	...	...	...	...	...	...	190
658	1 4	18	17	17	17	14	13	10	15	25	...	...	...	...	...	...	...	...	...	...	...	167
659	1 3	12	20	10	14	11	14	20	16	...	...	...	...	...	...	...	...	...	...	...	...	117
660	1 5	12	18	19	14	16	15	13	13	11	...	...	...	...	...	...	...	...	...	...	...	181
661	1 4	18	24	23	17	16	18	16	11	...	...	...	...	...	...	...	...	...	...	...	...	138
662	1 8	26	30	30	25	14	14	10	9	8	10	...	...	...	...	...	...	...	...	...	...	156
663	1 0	24	21	22	18	24	28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	137
664	1 1	26	21	23	18	18	19	15	7	...	...	...	...	...	...	...	...	...	...	...	...	150
665	1 2	34	26	22	17	24	20	26	24	...	...	...	...	...	...	...	...	...	...	...	...	153
666	1 1	33	28	2	12	23	23	25	23	...	...	...	...	...	...	...	...	...	...	...	...	188
667	1 1	25	21	15	18	22	24	24	24	...	...	...	...	...	...	...	...	...	...	...	...	153
668	1 1	14	28	24	27	24	22	24	24	...	...	...	...	...	...	...	...	...	...	...	...	1 5
669	1 0	24	24	29	21	26	24	14	...	...	...	...	...	...	...	...	...	...	...	...	...	166
670	1 2	18	29	29	21	23	22	16	...	...	...	...	...	...	...	...	...	...	...	...	...	160
671	1 6	20	19	10	11	10	13	10	11	14	14	28	...	...	...	...	...	...	...	...	...	155
672	1 0	23	27	27	24	22	16	14	...	...	...	...	...	...	...	...	...	...	...	...	...	153
673	1 0	21	24	20	15	15	15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	108
674	1 0	20	18	23	20	13	19	10	...	...	...	...	...	...	...	...	...	...	...	...	...	132
6 5	1 5	22	24	6	12	12	9	12	15	14	...	...	...	...	...	...	...	...	...	...	...	146
676	1 2	13	17	22	16	14	10	21	12	...	...	...	...	...	...	...	...	...	...	...	...	147
677	1 6	23	25	23	16	14	16	18	10	7	...	...	...	...	...	...	...	...	...	...	...	167
678	1 2	21	25	18	14	16	9	6	11	...	...	...	...	...	...	...	...	...	...	...	...	120
679	1 1	39	17	19	15	10	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	118
680	1 4	26	27	24	21	18	16	20	14	...	...	...	...	...	...	...	...	...	...	...	...	168
681	1 6	25	26	30	12	16	14	13	13	20	...	...	...	...	...	...	...	...	...	...	...	174
682	1 2	31	27	42	30	17	18	14	23	10	...	...	...	...	...	...	...	...	...	...	...	214
683	1 3	33	30	24	15	15	12	17	13	8	...	...	...	...	...	...	...	...	...	...	...	167
684	1 1	40	35	25	18	12	14	14	9	...	...	...	...	...	...	...	...	...	...	...	...	167
685	1 3	25	18	15	9	10	9	13	20	19	...	...	...	...	...	...	...	...	...	...	...	139
686	1 5	22	29	15	10	12	6	8	10	16	12	...	...	...	...	...	...	...	...	...	...	140
687	2 0	24	20	22	15	11	8	9	14	11	15	14	13	20	...	...	...	...	...	...	...	195
688	1 2	32	32	18	21	19	23	19	8	...	...	...	...	...	...	...	...	...	...	...	...	161
689	1 1	23	18	23	16	12	23	19	16	...	...	...	...	...	...	...	...	...	...	...	...	137
690	1 6	24	22	8	8	13	10	19	17	21	11	...	...	...	...	...	...	...	...	...	...	153
691	1 1	26	13	15	21	17	16	17	...	...	...	...	...	...	...	...	...	...	...	...	...	125
692	1 3	11	8	10	11	17	17	21	20	...	...	...	...	...	...	...	...	...	...	...	...	115
693	1 3	22	24	21	16	15	19	11	9	8	8	...	...	...	...	...	...	...	...	...	...	153
6 4	1 3	37	44	29	17	15	26	24	15	...	...	...	...	...	...	...	...	...	...	...	...	217
696	1 6	24	18	23	17	16	10	11	19	17	20	30	...	...	...	...	...	...	...	...	...	210
696	1 1	18	16	15	16	11	13	10	6	...	...	...	...	...	...	...	...	...	...	...	...	106
697	1 1	28	24	26	24	18	13	9	...	...	...	...	...	...	...	...	...	...	...	...	...	143
698	1 0	28	26	21	21	19	14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	126
699	1 2	22	20	19	21	13	15	7	12	...	...	...	...	...	...	...	...	...	...	...	...	128
700	1 4	23	16	18	19	18	11	9	8	8	...	...	...	...	...	...	...	...	...	...	...	148
701	1 3	40	30	11	16	17	11	9	19	5	...	...	...	...	...	...	...	...	...	...	...	148
702	1 1	25	22	17	16	18	24	23	...	...	...	...	...	...	...	...	...	...	...	...	...	142
703	1 6	16	20	24	12	9	16	12	15	16	19	5	...	...	...	...	...	...	...	...	...	164
704	1 6	23	25	18	14	10	14	19	16	12	9	9	...	...	...	...	...	...	...	...	...	169
705	1 0	17	14	18	19	18	15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	101
706	1 9	24	23	10	16	18	15	16	14	16	17	10	...	...	...	...	...	...	...	...	...	189
707	1 2	29	22	23	26	23	29	19	11	...	...	...	...	...	...	...	...	...	...	...	...	187
703	1 1	30	23	19	16	18	9	10	5	...	...	...	...	...	...	...	...	...	...	...	...	125
709	1 2	32	21	26	16	17	11	12	...	...	...	...	...	...	...	...	...	...	...	...	...	126
710	1 4	22	18	16	20	14	14	10	16	7	...	...	...	...	...	...	...	...	...	...	...	137

TABLE IV — (Continued).

SPECIMEN NUMBER <i>Continued.</i>	Diameter of top in inches.	TOP MEASUREMENTS.																Height of stump.	Combined length of logs.	Length of top.	Total height.		
		Number of rings per inch at top, counting from the heart outward.																					
640.....	10	15	13	14	19	9	....	....	....	....	....	....	....	....	....	....	....	2	4	40	0	78	0
641.....	9	14	14	16	18	13	....	....	....	....	....	....	....	....	....	....	....	2	10	40	0	81	10
642.....	11	14	15	9	11	17	9	....	....	....	....	....	....	....	....	....	....	3	6	40	0	86	0
643.....	11	15	15	16	13	16	13	....	....	....	....	....	....	....	....	....	....	3	0	52	4	93	1
644.....	8	10	13	15	19	....	....	....	....	....	....	....	....	....	....	....	....	3	2	53	4	88	11
645.....	8	12	16	17	19	....	....	....	....	....	....	....	....	....	....	....	....	3	2	53	4	83	1
646.....	9	16	12	13	14	7	....	....	....	....	....	....	....	....	....	....	....	3	4	53	4	81	2
647.....	8	11	12	16	14	....	....	....	....	....	....	....	....	....	....	....	....	3	0	53	4	89	7
648.....	10	11	12	13	15	15	....	....	....	....	....	....	....	....	....	....	....	2	8	53	4	84	6
649.....	9	11	12	16	14	9	....	....	....	....	....	....	....	....	....	....	....	4	4	53	4	88	8
650.....	6	18	13	13	17	....	....	....	....	....	....	....	....	....	....	....	....	3	10	53	4	76	10
651.....	8	8	10	14	13	....	....	....	....	....	....	....	....	....	....	....	....	3	0	40	0	64	2
652.....	8	8	11	16	13	....	....	....	....	....	....	....	....	....	....	....	....	3	2	40	0	71	9
653.....	7	8	8	12	14	13	....	....	....	....	....	....	....	....	....	....	....	4	1	53	4	78	5
654.....	8	8	11	20	16	....	....	....	....	....	....	....	....	....	....	....	....	2	4	53	4	79	2
655.....	8	8	12	14	17	....	....	....	....	....	....	....	....	....	....	....	....	4	0	26	8	53	4
656.....	8	11	13	16	16	....	....	....	....	....	....	....	....	....	....	....	....	3	0	28	8	56	8
657.....	8	10	14	13	13	6	....	....	....	....	....	....	....	....	....	....	....	3	8	40	0	65	2
658.....	12 3/4	16	17	16	18	11	14	11	....	....	....	....	....	....	....	....	....	3	8	28	8	68	4
659.....	9	11	12	17	17	10	....	....	....	....	....	....	....	....	....	....	....	3	10	40	0	76	5
660.....	8	11	11	16	14	....	....	....	....	....	....	....	....	....	....	....	....	4	0	40	0	75	6
661.....	8	11	16	20	15	8	....	....	....	....	....	....	....	....	....	....	....	3	0	40	0	73	0
662.....	8	13	14	7	11	....	....	....	....	....	....	....	....	....	....	....	....	3	10	53	4	75	6
663.....	8	11	16	16	13	....	....	....	....	....	....	....	....	....	....	....	....	4	0	26	8	54	2
664.....	8	13	14	25	11	....	....	....	....	....	....	....	....	....	....	....	....	3	4	40	0	70	0
665.....	7	10	15	12	13	....	....	....	....	....	....	....	....	....	....	....	....	4	1	53	4	88	0
666.....	8	10	16	14	12	....	....	....	....	....	....	....	....	....	....	....	....	3	10	40	0	88	10
667.....	8	12	14	14	15	....	....	....	....	....	....	....	....	....	....	....	....	3	0	40	0	85	6
668.....	8	11	16	13	17	....	....	....	....	....	....	....	....	....	....	....	....	3	10	40	0	71	2
669.....	10	12	13	18	16	....	....	....	....	....	....	....	....	....	....	....	....	3	10	28	8	84	6
670.....	7	10	14	14	16	....	....	....	....	....	....	....	....	....	....	....	....	4	2	51	4	76	2
671.....	8	11	12	15	15	....	....	....	....	....	....	....	....	....	....	....	....	3	8	53	4	77	7
672.....	8	14	9	12	16	....	....	....	....	....	....	....	....	....	....	....	....	3	10	40	0	70	1
673.....	9	10	16	15	8	....	....	....	....	....	....	....	....	....	....	....	....	3	10	40	0	70	9
674.....	9	11	14	17	11	8	....	....	....	....	....	....	....	....	....	....	....	3	2	28	8	68	4
675.....	10	16	11	13	12	16	....	....	....	....	....	....	....	....	....	....	....	2	6	40	0	74	0
676.....	10	16	10	16	13	11	....	....	....	....	....	....	....	....	....	....	....	3	6	28	8	68	2
677.....	10	15	13	13	13	10	....	....	....	....	....	....	....	....	....	....	....	3	8	40	0	69	8
678.....	8	12	12	16	10	....	....	....	....	....	....	....	....	....	....	....	....	3	2	40	0	69	8
679.....	9	12	10	14	8	8	....	....	....	....	....	....	....	....	....	....	....	3	8	36	8	37	10
680.....	11	12	16	16	9	8	7	....	....	....	....	....	....	....	....	....	....	3	0	28	8	37	4
681.....	8	14	11	17	10	....	....	....	....	....	....	....	....	....	....	....	....	3	2	53	4	72	2
682.....	9	15	16	12	11	11	....	....	....	....	....	....	....	....	....	....	....	3	4	40	0	71	0
683.....	9	12	14	14	8	7	....	....	....	....	....	....	....	....	....	....	....	3	10	40	0	75	2
684.....	10	14	14	13	13	12	....	....	....	....	....	....	....	....	....	....	....	3	10	26	8	67	0
685.....	8	11	17	10	11	6	....	....	....	....	....	....	....	....	....	....	....	2	4	40	0	57	1
686.....	11	10	11	12	12	15	17	....	....	....	....	....	....	....	....	....	....	3	2	26	8	56	11
687.....	9	10	12	13	12	16	....	....	....	....	....	....	....	....	....	....	....	3	2	26	8	56	4
688.....	8	12	13	14	16	10	....	....	....	....	....	....	....	....	....	....	....	4	4	53	4	81	4
689.....	8	9	18	16	13	....	....	....	....	....	....	....	....	....	....	....	....	3	8	40	0	78	8
690.....	11	12	12	16	15	8	8	....	....	....	....	....	....	....	....	....	....	3	6	40	0	69	2
691.....	8	12	12	10	15	....	....	....	....	....	....	....	....	....	....	....	....	3	10	40	0	71	2
692.....	7	10	14	12	10	....	....	....	....	....	....	....	....	....	....	....	....	3	10	40	0	74	2
693.....	8	10	13	10	10	....	....	....	....	....	....	....	....	....	....	....	....	2	10	53	4	75	6
694.....	8	12	17	18	9	....	....	....	....	....	....	....	....	....	....	....	....	2	6	40	0	65	6
695.....	11	11	14	10	23	16	19	....	....	....	....	....	....	....	....	....	....	3	4	40	0	68	10
696.....	8	12	12	10	10	....	....	....	....	....	....	....	....	....	....	....	....	4	0	53	4	87	7
697.....	8	11	16	9	9	9	....	....	....	....	....	....	....	....	....	....	....	2	10	16	8	54	10
698.....	8	8	18	12	12	....	....	....	....	....	....	....	....	....	....	....	....	3	0	40	0	75	10
699.....	8	10	14	15	10	....	....	....	....	....	....	....	....	....	....	....	....	3	8	26	8	65	10
700.....	8	16	2	14	8	....	....	....	....	....	....	....	....	....	....	....	....	2	4	40	0	67	8
701.....	8	12	9	13	13	....	....	....	....	....	....	....	....	....	....	....	....	3	2	40	0	71	5
702.....	8	13	16	15	12	....	....	....	....	....	....	....	....	....	....	....	....	3	8	47	0	61	2
703.....	9	14	16	16	22	24	....	....	....	....	....	....	....	....	....	....	....	2	8	26	8	55	8
704.....	9	16	16	15	23	23	....	....	....	....	....	....	....	....	....	....	....	2	4	40	0	66	4
705.....	8	12	17	14	20	....	....	....	....	....	....	....	....	....	....	....	....	3	0	40	0	73	4
706.....	12	15	16	17	22	21	18	....	....	....	....	....	....	....	....	....	....	1	10	26	8	64	6
707.....	9	16	16	19	18	17	....	....	....	....	....	....	....	....	....	....	....	3	0	40	0	77	4
708.....	7	14	18	13	19	....	....	....	....	....	....	....	....	....	....	....	....	2	4	40	0	71	2
709.....	8	12	13	16	16	....	....	....	....	....	....	....	....	....	....	....	....	1	0	26	8	69	0
710.....	8	12	13	16	16	....	....	....	....	....	....	....	....	....	....	....	....	2	4	40	0	64	6
		13	18	18	17	....	....	....	....	....	....	....	....	....	....	....	....	2	4	53	4	79	2



TABLE IV — (Continued).

SPECIMEN NUMBER Continued.	Diameter of top in inches.	TOP MEASUREMENTS.										Height of stump.	Combined length of logs.	Length of top.	Total height.
		Number of rings per inch at top, counting from the heart outward.													
711.....	8	16	13	15	16	7	.....	.....	.....	.....	.....	2' 5"	26' 8"	35' 4"	67' 3"
712.....	8	11	14	15	16	.....	.....	.....	.....	.....	.....	2' 1"	31' 8"	23' 6"	56' 3"
713.....	9	10	8	15	13	12	.....	.....	.....	.....	.....	1' 8"	26' 8"	42' 6"	70 10
714.....	9	13	6	22	20	16	.....	.....	.....	.....	.....	1' 10"	13' 4"	45 10	61 0
715.....	9	15	16	19	21	10	.....	.....	.....	.....	.....	1' 6"	13' 4"	46' 4"	61' 2
716.....	9	14	18	18	17	13	.....	.....	.....	.....	.....	2' 2"	40' 0"	33' 7"	74' 9
717.....	11	8	14	23	21	20	19	.....	.....	.....	.....	2' 6"	53' 4"	27' 0"	82 10
718.....	8	8	9	17	24	23	11	.....	.....	.....	.....	2' 6"	53' 4"	26' 0"	81 10
719.....	10	10	9	16	20	24	.....	.....	.....	.....	.....	3' 0"	66' 8"	31' 4"	91' 0
720.....	9	11	12	14	17	17	.....	.....	.....	.....	.....	3' 0"	66' 8"	23' 6"	93' 2
721.....	8	12	12	12	16	19	.....	.....	.....	.....	.....	2' 4"	66' 8"	23' 8"	91' 8
722.....	10	13	12	16	18	9	.....	.....	.....	.....	.....	2' 8"	53' 4"	24' 0"	80' 0
723.....	8	13	12	13	16	.....	.....	.....	.....	.....	.....	3' 0"	26' 8"	30' 0"	53' 8
724.....	8	14	10	13	13	.....	.....	.....	.....	.....	.....	1' 6"	26' 8"	30' 8"	58 10
725.....	8	14	16	13	12	.....	.....	.....	.....	.....	.....	2' 0"	36' 8"	33' 9"	63' 5
726.....	8	11	14	14	14	.....	.....	.....	.....	.....	.....	1' 10"	36' 8"	31' 4"	59 10
727.....	10	11	11	16	17	14	.....	.....	.....	.....	.....	2' 0"	26' 8"	39 10	68' 6
728.....	8½	11	10	15	18	7	.....	.....	.....	.....	.....	2' 8"	26' 8"	40' 0"	69' 4
729.....	8	13	11	12	16	.....	.....	.....	.....	.....	.....	2' 6"	26' 8"	37' 8"	66 10
730.....	8	11	14	14	15	.....	.....	.....	.....	.....	.....	2' 4"	40' 0"	27' 6"	69 10
731.....	7	10	10	16	12	.....	.....	.....	.....	.....	.....	1' 3"	26' 8"	29' 4"	57' 8
732.....	9	13	12	14	16	9	.....	.....	.....	.....	.....	2' 8"	40' 0"	34 10	77' 6
733.....	7	12	16	14	14	.....	.....	.....	.....	.....	.....	2' 4"	40' 0"	32' 6"	74 10
734.....	8	16	17	16	12	.....	.....	.....	.....	.....	.....	2' 6"	53' 4"	24' 0"	79 10
735.....	9	11	13	17	11	9	.....	.....	.....	.....	.....	2' 6"	26' 8"	36 10	76' 0
736.....	8	12	12	14	15	.....	.....	.....	.....	.....	.....	1' 10"	13' 4"	48' 6"	63' 8
737.....	8	12	14	15	16	.....	.....	.....	.....	.....	.....	2' 3"	26' 8"	34' 9"	63' 8
738.....	8	14	13	10	19	.....	.....	.....	.....	.....	.....	3' 2"	26' 8"	28' 4"	78' 2
739.....	8½	13	17	16	13	8	.....	.....	.....	.....	.....	2' 0"	26' 8"	29' 0"	57' 8
740.....	8	14	16	16	12	.....	.....	.....	.....	.....	.....	2' 4"	53' 4"	26' 6"	82' 2
741.....	8	10	11	17	13	.....	.....	.....	.....	.....	.....	2' 0"	26' 8"	28' 0"	56' 8
742.....	10	11	13	16	13	12	.....	.....	.....	.....	.....	2' 1"	40' 0"	31 10	73 11
743.....	10	13	16	14	16	13	.....	.....	.....	.....	.....	3' 3"	53' 4"	30' 2"	76' 9
744.....	10	16	15	12	13	13	.....	.....	.....	.....	.....	3' 1"	53' 4"	26' 8"	93' 1
745.....	8	10	14	11	16	.....	.....	.....	.....	.....	.....	2' 4"	53' 4"	33' 0"	86' 8
746.....	8	12	16	16	15	.....	.....	.....	.....	.....	.....	3' 8"	26' 8"	27' 6"	57 10
747.....	10	14	18	12	15	13	.....	.....	.....	.....	.....	3' 0"	47' 0"	34' 8"	84' 8
748.....	10	12	14	16	12	8	.....	.....	.....	.....	.....	2' 8"	26' 8"	29' 0"	78' 4
749.....	10	13	16	14	16	16	.....	.....	.....	.....	.....	2' 4"	26' 8"	36' 7"	65' 7
750.....	9	14	14	16	16	12	.....	.....	.....	.....	.....	1' 10"	40' 0"	34' 4"	76' 2
751.....	9	10	17	15	8	11	.....	.....	.....	.....	.....	1' 10"	26' 8"	33' 8"	62' 2
752.....	9	17	21	11	12	9	.....	.....	.....	.....	.....	3' 1"	66' 8"	23' 4"	93' 1
753.....	8	12	13	16	15	.....	.....	.....	.....	.....	.....	2' 0"	40' 0"	24 10	66 10
754.....	8	13	16	10	14	.....	.....	.....	.....	.....	.....	2' 4"	40' 0"	30' 0"	72' 4
755.....	8	8	11	17	16	.....	.....	.....	.....	.....	.....	2' 1"	26' 8"	28' 9"	57' 6
756.....	10	16	21	17	16	12	.....	.....	.....	.....	.....	2' 6"	53' 4"	26' 6"	83' 4
757.....	9	13	16	19	11	8	.....	.....	.....	.....	.....	2' 8"	12' 4"	21' 2"	77' 3
758.....	9	16	11	11	15	12	.....	.....	.....	.....	.....	3' 0"	53' 4"	23 10	80' 2
759.....	8	10	14	18	12	.....	.....	.....	.....	.....	.....	2' 0"	53' 4"	25' 6"	80 10
760.....	8	13	14	15	13	8	.....	.....	.....	.....	.....	2' 6"	40' 0"	28' 4"	70 10
761.....	8	12	15	19	16	13	.....	.....	.....	.....	.....	2' 2"	40' 0"	25' 6"	67' 8
762.....	8	19	17	12	11	.....	.....	.....	.....	.....	.....	2' 8"	40' 0"	24' 4"	67' 0
763.....	8	18	12	14	14	.....	.....	.....	.....	.....	.....	2' 10"	40' 0"	26' 8"	69' 6
764.....	9	21	12	16	16	14	.....	.....	.....	.....	.....	2' 10"	53' 4"	23' 8"	78 10
765.....	8	17	16	18	14	.....	.....	.....	.....	.....	.....	3' 0"	53' 4"	27' 4"	83' 8
766.....	12	19	12	16	16	19	8	.....	.....	.....	.....	3' 2"	26' 8"	34 10	64' 8
767.....	8	11	15	16	12	.....	.....	.....	.....	.....	.....	4' 2"	66' 8"	19 10	90' 8
768.....	9	16	12	14	12	8	.....	.....	.....	.....	.....	3' 2"	26' 8"	31' 8"	61' 6
769.....	10	14	16	15	15	10	.....	.....	.....	.....	.....	3' 1"	45' 0"	28' 6"	76' 7
770.....	9	16	16	12	14	14	.....	.....	.....	.....	.....	3' 4"	53' 4"	20' 6"	87' 2
771.....	8	12	12	10	16	.....	.....	.....	.....	.....	.....	2' 3"	26' 8"	28' 4"	57' 3
772.....	8	14	12	15	15	.....	.....	.....	.....	.....	.....	2' 4"	40' 0"	26 10	69' 2
773.....	11	17	12	15	17	12	.....	.....	.....	.....	.....	3' 3"	26' 8"	45' 7"	75' 6
774.....	8	16	8	16	16	12	15	.....	.....	.....	.....	2' 8"	26' 8"	41' 6"	70 10
775.....	8	18	14	15	15	.....	.....	.....	.....	.....	.....	3' 2"	53' 4"	27' 6"	84' 0
776.....	9	16	19	12	16	10	.....	.....	.....	.....	.....	3' 1"	26' 8"	39' 0"	68' 9
777.....	8	19	22	16	12	.....	.....	.....	.....	.....	.....	2' 10"	53' 4"	26' 8"	82 10
778.....	8	16	12	18	14	.....	.....	.....	.....	.....	.....	2' 6"	26' 8"	36 10	66' 0
779.....	9	14	19	16	12	16	.....	.....	.....	.....	.....	2' 4"	26' 8"	38' 4"	67' 4
780.....	10	16	16	11	12	13	.....	.....	.....	.....	.....	2' 6"	26' 8"	34' 3"	61' 5
781.....	9	18	14	12	12	.....	.....	.....	.....	.....	.....	3' 1"	26' 8"	30' 0"	59' 9
782.....	8	18	20	11	13	5	.....	.....	.....	.....	.....	2' 2"	26' 8"	33' 7"	62' 5



TABLE IV—(Continued).

[illegible]

THE ADIRONDACK BLACK SPRUCE.

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TABLE IV — (Continued).

SPECIMEN NUMBER	Diameter of top in inches.	TOP MEASUREMENTS.										Height of stump.	Combined length of logs.	Length of top.	Total height.
		Number of rings per inch at top, counting from the heart outward.													
783.....	8	12	17	14	15	.....	.....	.....	.....	.....	.....	2	28	32	61
784.....	8	12	17	14	15	.....	.....	.....	.....	.....	.....	2	28	32	60
785.....	8	16	16	19	12	7	.....	.....	.....	.....	.....	2	28	34	63
786.....	8	16	18	17	17	12	.....	.....	.....	.....	.....	2	28	31	60
787.....	8	18	12	10	19	6	.....	.....	.....	.....	.....	2	11	24	67
788.....	14	18	16	21	20	17	16	8	6	.....	.....	2	11	40	88
789.....	9	10	14	19	11	10	.....	.....	.....	.....	.....	4	0	34	91
790.....	8	12	14	14	15	.....	.....	.....	.....	.....	.....	2	0	31	60
791.....	8	16	15	15	17	.....	.....	.....	.....	.....	.....	2	0	24	66
792.....	14	18	17	15	14	12	16	8	.....	.....	.....	2	0	38	82
793.....	8	16	17	12	14	7	.....	.....	.....	.....	.....	4	2	34	65
794.....	8	12	18	14	16	10	.....	.....	.....	.....	.....	2	2	33	63
795.....	8	14	16	16	17	.....	.....	.....	.....	.....	.....	2	0	24	67
796.....	8	16	12	20	8	6	.....	.....	.....	.....	.....	2	0	27	70
797.....	10	18	19	14	10	8	.....	.....	.....	.....	.....	2	8	34	63
798.....	10	14	17	10	12	14	.....	.....	.....	.....	.....	2	0	26	59
799.....	12	16	18	14	10	16	9	.....	.....	.....	.....	2	1	33	89
800.....	8	14	12	17	15	10	.....	.....	.....	.....	.....	2	8	27	84
801.....	10	16	16	14	15	12	.....	.....	.....	.....	.....	4	0	26	84
802.....	10	14	11	16	14	10	.....	.....	.....	.....	.....	2	8	36	79
803.....	9	18	9	18	12	7	.....	.....	.....	.....	.....	2	8	26	83
804.....	9	11	13	14	18	10	.....	.....	.....	.....	.....	2	8	31	74
805.....	8	12	6	11	14	15	.....	.....	.....	.....	.....	2	11	31	87
806.....	8	14	12	17	10	.....	.....	.....	.....	.....	.....	2	0	19	76
807.....	8	18	16	15	17	.....	.....	.....	.....	.....	.....	4	6	24	69
808.....	8	16	15	12	17	.....	.....	.....	.....	.....	.....	2	6	26	68
809.....	9	14	18	12	13	14	.....	.....	.....	.....	.....	2	0	38	55
810.....	8	16	17	11	14	.....	.....	.....	.....	.....	.....	2	0	21	77
811.....	8	15	14	11	10	12	.....	.....	.....	.....	.....	2	4	24	81
812.....	8	16	17	12	9	6	.....	.....	.....	.....	.....	2	2	27	70
813.....	8	14	16	12	12	.....	.....	.....	.....	.....	.....	2	8	23	66
814.....	8	16	15	12	11	.....	.....	.....	.....	.....	.....	2	2	34	81
815.....	8	19	12	14	10	.....	.....	.....	.....	.....	.....	2	2	27	83
816.....	10	14	16	19	14	10	.....	.....	.....	.....	.....	2	4	29	73
817.....	9	16	18	12	15	10	.....	.....	.....	.....	.....	2	0	24	80
818.....	10	11	12	14	14	11	.....	.....	.....	.....	.....	2	8	30	72
819.....	8	16	16	14	13	.....	.....	.....	.....	.....	.....	2	10	26	69
820.....	8	14	15	12	17	5	.....	.....	.....	.....	.....	2	10	24	67
821.....	8	18	20	12	14	.....	.....	.....	.....	.....	.....	2	6	31	60
822.....	14	18	18	15	14	13	15	17	14	.....	.....	2	0	42	85
823.....	9	13	14	16	19	12	.....	.....	.....	.....	.....	2	10	27	83
824.....	8 1/2	18	16	16	10	8	.....	.....	.....	.....	.....	2	10	32	62
825.....	8	14	13	15	15	6	.....	.....	.....	.....	.....	2	2	33	90
826.....	10	16	14	13	12	14	.....	.....	.....	.....	.....	2	6	42	73
827.....	8	14	13	15	12	.....	.....	.....	.....	.....	.....	2	6	23	66
828.....	9	16	14	11	13	12	.....	.....	.....	.....	.....	2	2	38	68
829.....	9	7	15	12	18	12	.....	.....	.....	.....	.....	2	3	28	71
830.....	9	14	12	16	13	18	.....	.....	.....	.....	.....	2	0	34	63
831.....	9	16	14	14	13	14	.....	.....	.....	.....	.....	2	10	27	84
832.....	18	13	14	12	13	14	12	12	.....	.....	.....	4	0	30	87
833.....	11	14	12	14	11	18	11	.....	.....	.....	.....	2	4	32	89
834.....	8	16	12	11	15	.....	.....	.....	.....	.....	.....	2	0	28	71
835.....	8	14	12	11	14	10	.....	.....	.....	.....	.....	2	5	30	59
836.....	8	15	12	14	13	.....	.....	.....	.....	.....	.....	2	8	31	60
837.....	11	14	15	11	13	18	.....	.....	.....	.....	.....	2	0	38	81
838.....	10	13	12	16	14	10	.....	.....	.....	.....	.....	2	2	37	80
839.....	8	13	14	12	14	.....	.....	.....	.....	.....	.....	4	0	27	98
840.....	10	14	13	11	12	12	.....	.....	.....	.....	.....	2	8	31	88
841.....	10	16	14	14	12	15	.....	.....	.....	.....	.....	2	10	36	79
842.....	8	16	12	2	17	.....	.....	.....	.....	.....	.....	2	8	26	69
843.....	9	14	13	15	16	12	.....	.....	.....	.....	.....	2	4	28	85
844.....	9	16	14	12	13	12	.....	.....	.....	.....	.....	2	1	21	91
845.....	8	16	13	12	14	.....	.....	.....	.....	.....	.....	2	8	31	60
846.....	10	14	15	11	16	12	.....	.....	.....	.....	.....	2	10	33	76
847.....	8	14	15	13	16	.....	.....	.....	.....	.....	.....	2	8	34	63
848.....	9	16	15	12	13	8	.....	.....	.....	.....	.....	2	0	31	74
849.....	8	12	14	17	10	6	.....	.....	.....	.....	.....	2	10	27	83
850.....	8	12	16	14	11	.....	.....	.....	.....	.....	.....	2	8	26	69
851.....	10	14	18	12	12	10	.....	.....	.....	.....	.....	2	2	43	73
852.....	8	16	14	15	12	6	.....	.....	.....	.....	.....	2	1	26	69
853.....	8	14	14	16	19	.....	.....	.....	.....	.....	.....	2	10	36	92
854.....	10	13	17	15	19	14	.....	.....	.....	.....	.....	2	8	42	71
855.....	10	14	16	15	11	11	.....	.....	.....	.....	.....	2	4	41	60

TABLE IV—(Continued).

[illegible]

TABLE IV — (Continued).

SPECIMEN NUMBER <i>Continued.</i>	Diameter of top in inches.	TOP MEASUREMENTS.										Height of stump.	Combined length of logs.	Length of top.	Total height.
		Number of rings per inch at top, counting from the heart outward.													
856.....	9	14	15	13	12	16	.....	.....	.....	.....	.....	2 4	52 4	28 3	84 11
857.....	9	14	10	11	12	.....	.....	.....	.....	.....	.....	2 6	56 8	23 7	92 9
858.....	9	14	16	13	10	11	.....	.....	.....	.....	.....	2 4	40 0	37 6	70 10
859.....	9	16	15	12	13	.....	.....	.....	.....	.....	.....	2 6	53 4	26 5	83 8
860.....	9	12	13	17	14	10	.....	.....	.....	.....	.....	2 2	26 8	33 8	63 6
861.....	9	14	13	12	14	.....	.....	.....	.....	.....	.....	2 8	53 4	23 4	78 4
862.....	9	16	12	15	11	.....	.....	.....	.....	.....	.....	2 0	26 8	32 6	65 8
863.....	9	14	16	10	13	.....	.....	.....	.....	.....	.....	2 0	26 8	32 6	61 2
864.....	9	10	16	16	12	6	.....	.....	.....	.....	.....	2 8	40 0	36 11	79 7
865.....	9	9	11	17	12	14	.....	.....	.....	.....	.....	2 6	40 0	34 9	77 3
866.....	10	12	11	12	16	19	.....	.....	.....	.....	.....	2 8	26 8	45 4	74 8
867.....	9	12	16	17	10	10	.....	.....	.....	.....	.....	2 0	53 4	33 10	89 2
868.....	8	16	11	14	10	5	.....	.....	.....	.....	.....	2 2	26 8	31 7	63 5
869.....	12	10	16	11	.....	.....	.....	.....	.....	.....	.....	2 4	26 8	33 0	63 0
870.....	10	14	17	18	11	11	.....	.....	.....	.....	.....	2 2	53 4	31 4	87 10
871.....	9	16	14	12	13	10	.....	.....	.....	.....	.....	2 0	66 8	26 10	96 6
872.....	9	14	15	10	17	12	.....	.....	.....	.....	.....	2 10	40 0	34 8	77 1
873.....	9	16	12	11	14	7	.....	.....	.....	.....	.....	2 7	26 8	43 8	71 11
874.....	10	12	13	10	17	15	.....	.....	.....	.....	.....	2 5	26 8	34 11	64 0
875.....	8	14	14	14	9	.....	.....	.....	.....	.....	.....	2 6	26 8	37 3	66 5
876.....	8	16	12	11	8	.....	.....	.....	.....	.....	.....	2 8	26 8	34 8	64 0
877.....	8	14	17	13	10	7	.....	.....	.....	.....	.....	2 4	26 8	33 5	62 1
878.....	10	16	12	12	17	11	.....	.....	.....	.....	.....	2 11	40 0	26 10	69 6
879.....	9	14	19	13	15	10	.....	.....	.....	.....	.....	2 2	26 8	31 6	60 4
880.....	8	10	16	10	18	.....	.....	.....	.....	.....	.....	2 10	40 0	30 8	73 6
881.....	8	14	12	12	11	.....	.....	.....	.....	.....	.....	2 8	26 8	27 4	56 8
882.....	8	16	14	10	9	.....	.....	.....	.....	.....	.....	2 4	26 8	26 0	55 0
883.....	8	6	12	11	11	10	.....	.....	.....	.....	.....	2 1	26 8	27 6	57 3
884.....	10	16	16	12	13	9	.....	.....	.....	.....	.....	2 10	40 0	24 7	67 5
885.....	9	14	11	15	10	12	.....	.....	.....	.....	.....	2 3	40 0	26 0	63 3
886.....	7	12	14	9	11	.....	.....	.....	.....	.....	.....	2 1	26 8	27 0	55 9
887.....	9	16	16	10	12	17	.....	.....	.....	.....	.....	2 3	40 0	29 3	71 6
888.....	8	11	12	18	10	.....	.....	.....	.....	.....	.....	1 11	23 8	39 6	68 1
889.....	9	17	11	0	14	12	.....	.....	.....	.....	.....	4 0	53 4	25 6	83 0
890.....	10	14	16	10	10	17	.....	.....	.....	.....	.....	3 10	53 4	27 6	84 8
891.....	9	14	11	15	16	.....	.....	.....	.....	.....	.....	2 4	13 4	45 10	61 6
892.....	9	12	19	11	14	10	.....	.....	.....	.....	.....	2 4	40 0	23 6	70 10
893.....	8	16	12	13	14	.....	.....	.....	.....	.....	.....	2 2	26 8	27 4	56 2
894.....	8	14	14	17	13	7	.....	.....	.....	.....	.....	2 4	21 8	29 3	58 3
895.....	8	16	12	14	10	.....	.....	.....	.....	.....	.....	2 6	26 8	21 8	50 10
896.....	9	16	14	15	10	11	.....	.....	.....	.....	.....	2 2	13 4	42 10	58 4
897.....	8	14	17	17	14	.....	.....	.....	.....	.....	.....	2 2	26 8	31 4	60 2
898.....	12	16	16	18	12	14	14	7	.....	.....	.....	3 0	26 8	43 8	73 4
899.....	8	19	12	12	14	.....	.....	.....	.....	.....	.....	2 8	53 4	24 3	80 3
900.....	10	19	10	17	12	10	.....	.....	.....	.....	.....	3 1	66 8	21 10	91 7
901.....	8	14	14	13	9	.....	.....	.....	.....	.....	.....	2 4	26 8	41 2	70 2
902.....	7	16	11	14	16	.....	.....	.....	.....	.....	.....	2 4	26 8	34 10	63 10
903.....	9	13	14	14	17	10	.....	.....	.....	.....	.....	2 6	40 0	33 0	75 6
904.....	9	11	14	14	12	16	.....	.....	.....	.....	.....	2 8	53 4	27 0	83 0
905.....	0	11	12	10	9	15	.....	.....	.....	.....	.....	2 0	40 0	33 7	76 7
906.....	8	14	16	12	14	.....	.....	.....	.....	.....	.....	1 10	26 8	31 2	59 8
907.....	9	2	14	15	12	12	.....	.....	.....	.....	.....	2 0	26 8	36 0	64 8
908.....	9	18	13	2	14	12	.....	.....	.....	.....	.....	2 4	40 0	21 6	63 10
909.....	8	12	14	9	10	6	.....	.....	.....	.....	.....	2 0	66 8	19 10	89 6
910.....	10	16	15	8	9	11	.....	.....	.....	.....	.....	2 8	26 8	30 0	59 4
911.....	9	16	12	12	10	9	.....	.....	.....	.....	.....	2 0	53 4	22 6	78 10
912.....	9	14	11	8	13	10	.....	.....	.....	.....	.....	2 2	53 4	21 4	77 10
913.....	10	12	13	14	14	9	.....	.....	.....	.....	.....	2 0	53 4	30 8	87 0
914.....	9	13	16	12	16	10	.....	.....	.....	.....	.....	4 2	40 0	34 11	79 1
915.....	8	14	16	12	13	.....	.....	.....	.....	.....	.....	2 0	40 0	29 7	72 7
916.....	9	16	11	13	13	10	.....	.....	.....	.....	.....	2 2	34 8	29 0	66 10
917.....	8	14	12	14	14	.....	.....	.....	.....	.....	.....	4 4	53 4	23 10	80 6
918.....	13	4	2	13	11	13	10	6	.....	.....	.....	4 1	40 0	43 4	86 5
919.....	9	14	12	13	12	11	.....	.....	.....	.....	.....	3 10	53 4	31 8	88 10
920.....	10	13	16	12	12	13	.....	.....	.....	.....	.....	4 2	53 4	29 8	87 2
921.....	10	16	13	14	12	10	.....	.....	.....	.....	.....	4 0	26 8	41 6	72 2
922.....	9	12	14	14	13	12	.....	.....	.....	.....	.....	4 2	40 0	34 10	79 0
923.....	10	14	11	11	6	15	6	.....	.....	.....	.....	4 4	40 0	43 0	87 4
924.....	9	12	13	13	16	6	.....	.....	.....	.....	.....	4 0	26 8	43 6	74 2
925.....	9 1/2	13	12	14	15	12	.....	.....	.....	.....	.....	3 10	26 8	40 8	71 2
926.....	8	2	13	14	10	.....	.....	.....	.....	.....	.....	2 8	40 0	33 7	75 3
927.....	10	14	14	11	10	9	.....	.....	.....	.....	.....	2 6	26 8	43 6	71 8
928.....	8	15	13	11	14	.....	.....	.....	.....	.....	.....	2 10	40 0	29 8	72 6

TABLE IV—(Concluded).

SPECIMEN NUMBER.	Diameter of stump.	MEASUREMENTS ON STUMP.																				Age in years.
		Number of rings per inch on stump, counting from the heart outward.																				
929	1' 8"	18	32	27	38	13	17	18	18	...	...	...	...	...	...	...	...	...	...	...	156	
930	1' 4"	22	28	28	32	17	17	18	22	...	...	...	...	...	...	...	...	...	...	...	160	
931	1' 2"	22	28	28	32	17	17	18	18	...	...	...	...	...	...	...	...	...	...	...	159	
932	1' 5"	22	24	25	35	22	18	14	22	12	...	...	...	...	...	...	...	...	...	...	184	
933	1' 0"	22	26	22	38	0	18	18	...	...	...	...	...	...	...	...	...	...	...	...	127	
934	1' 1"	22	25	30	37	18	20	9	...	...	...	...	...	...	...	...	...	...	...	...	141	
935	1' 2"	14	16	18	10	12	11	13	10	...	...	...	...	...	...	...	...	...	...	...	104	
936	1' 2"	19	24	24	20	13	17	20	8	...	...	...	...	...	...	...	...	...	...	...	149	
937	1' 0"	18	24	24	16	16	36	...	...	...	...	...	...	...	...	...	...	...	...	...	134	
938	1' 0"	26	26	19	20	12	28	...	...	...	...	...	...	...	...	...	...	...	...	...	130	
939	1' 4"	24	30	24	16	19	17	20	17	5	...	...	...	...	...	...	...	...	...	...	188	
940	1' 4"	28	34	28	22	25	19	22	...	...	...	...	...	...	...	...	...	...	...	...	178	
941	1' 5"	28	24	14	16	16	16	16	10	12	...	...	...	...	...	...	...	...	...	...	153	
942	1' 4"	21	26	24	18	22	16	21	12	6	...	...	...	...	...	...	...	...	...	...	166	
943	1' 2"	17	22	22	20	2	26	11	...	...	...	...	...	...	...	...	...	...	...	...	140	
944	1' 6"	23	30	26	21	22	22	15	8	11	6	...	...	...	...	...	...	...	...	...	189	
945	1' 6"	20	19	18	25	18	15	14	12	18	11	...	...	...	...	...	...	...	...	...	170	
946	1' 8"	21	22	22	24	12	18	14	13	12	14	28	...	...	...	...	...	...	...	...	211	
947	1' 1"	22	26	28	24	24	20	9	...	...	...	...	...	...	...	...	...	...	...	...	153	
948	1' 6"	24	20	19	18	19	19	18	16	19	28	...	...	...	...	...	...	...	...	...	200	
949	1' 2"	17	22	26	25	24	16	17	7	...	...	...	...	...	...	...	...	...	...	...	154	
950	1' 8"	24	23	30	23	26	14	18	9	18	17	12	...	...	...	...	...	...	...	...	221	
951	1' 4"	26	28	28	16	11	18	7	13	...	...	...	...	...	...	...	...	...	...	...	160	
952	1' 1"	24	26	22	14	20	18	15	...	...	...	...	...	...	...	...	...	...	...	...	143	
953	1' 6"	28	30	30	16	14	18	14	3	9	...	...	...	...	...	...	...	...	...	...	179	
954	1' 8"	18	20	20	13	14	18	11	15	18	21	12	...	...	...	...	...	...	...	...	185	
955	1' 1"	23	16	20	24	20	7	7	...	...	...	...	...	...	...	...	...	...	...	...	127	
956	1' 1"	21	16	24	22	7	21	16	...	...	...	...	...	...	...	...	...	...	...	...	140	
957	1' 2"	18	24	28	28	18	23	19	...	...	...	...	...	...	...	...	...	...	...	...	158	
958	1' 1"	28	30	26	17	15	14	15	...	...	...	...	...	...	...	...	...	...	...	...	145	
959	1' 2"	24	20	19	13	16	14	15	8	...	...	...	...	...	...	...	...	...	...	...	134	
960	1' 2"	18	19	20	22	22	20	14	4	...	...	...	...	...	...	...	...	...	...	...	139	
961	1' 3"	30	34	19	13	13	10	13	9	...	...	...	...	...	...	...	...	...	...	...	146	
962	1' 3"	36	30	15	15	11	15	18	8	...	...	...	...	...	...	...	...	...	...	...	170	
963	1' 3"	34	38	22	17	18	13	20	13	18	...	...	...	...	...	...	...	...	...	...	155	
964	1' 8"	24	22	25	25	25	16	12	12	18	16	...	...	...	...	...	...	...	...	...	196	
965	2' 0"	30	29	34	17	14	12	10	9	10	12	14	18	...	...	...	...	...	...	...	209	
966	1' 2"	36	30	32	23	26	14	18	10	...	...	...	...	...	...	...	...	...	...	...	184	
967	1' 4"	26	28	18	20	15	15	16	20	...	...	...	...	...	...	...	...	...	...	...	158	
968	1' 0"	30	34	21	21	19	15	8	...	...	...	...	...	...	...	...	...	...	...	...	138	
969	1' 8"	22	36	23	14	12	12	8	13	17	14	...	...	...	...	...	...	...	...	...	171	
970	1' 5"	36	42	29	33	14	10	11	13	12	7	...	...	...	...	...	...	...	...	...	196	
971	1' 0"	36	42	38	19	17	15	...	...	...	...	...	...	...	...	...	...	...	...	...	167	
972	1' 0"	24	18	28	27	14	13	...	...	...	...	...	...	...	...	...	...	...	...	...	133	
973	1' 1"	28	29	15	21	13	10	4	...	...	...	...	...	...	...	...	...	...	...	...	120	
974	1' 0"	21	26	24	19	13	8	...	...	...	...	...	...	...	...	...	...	...	...	...	111	
975	1' 2"	24	26	14	13	8	15	13	11	...	...	...	...	...	...	...	...	...	...	...	123	
976	1' 2"	22	17	14	21	30	13	19	9	...	...	...	...	...	...	...	...	...	...	...	135	
977	1' 0"	20	19	23	21	20	20	10	...	...	...	...	...	...	...	...	...	...	...	...	138	
978	1' 2"	30	20	17	16	14	18	9	...	...	...	...	...	...	...	...	...	...	...	...	124	
979	1' 1"	18	14	18	12	18	14	20	...	...	...	...	...	...	...	...	...	...	...	...	114	
980	1' 0"	18	17	16	15	20	15	6	...	...	...	...	...	...	...	...	...	...	...	...	107	
931	1' 1"	28	18	16	16	13	14	17	23	...	...	...	...	...	...	...	...	...	...	...	144	
982	1' 4"	21	27	20	21	17	18	16	18	...	...	...	...	...	...	...	...	...	...	...	168	
983	1' 6"	25	21	21	22	16	14	14	16	10	9	...	...	...	...	...	...	...	...	...	176	
984	1' 1"	32	24	18	16	18	15	14	10	...	...	...	...	...	...	...	...	...	...	...	147	
985	1' 4"	21	20	20	13	17	22	14	18	...	...	...	...	...	...	...	...	...	...	...	150	
986	1' 8"	23	26	24	16	14	16	15	20	17	15	...	...	...	...	...	...	...	...	...	186	
987	1' 6"	24	22	24	12	13	18	9	12	10	9	...	...	...	...	...	...	...	...	...	148	
988	1' 0"	22	28	22	16	15	20	...	...	...	...	...	...	...	...	...	...	...	...	...	132	
989	1' 1"	26	28	28	16	20	16	13	...	...	...	...	...	...	...	...	...	...	...	...	147	
990	1' 0"	30	23	24	13	17	15	...	...	...	...	...	...	...	...	...	...	...	...	...	133	
991	1' 2"	18	22	22	24	14	16	17	...	...	...	...	...	...	...	...	...	...	...	...	133	
992	1' 6"	24	20	25	16	13	7	8	11	13	11	...	...	...	...	...	...	...	...	...	48	
993	1' 0"	23	24	15	15	14	15	8	...	...	...	...	...	...	...	...	...	...	...	...	114	
994	1' 0"	22	23	11	17	12	10	...	...	...	...	...	...	...	...	...	...	...	...	...	95	
995	1' 1"	30	30	31	22	17	18	26	...	...	...	...	...	...	...	...	...	...	...	...	173	
996	1' 6"	25	23	24	13	14	23	14	15	13	26	...	...	...	...	...	...	...	...	...	20	
997	1' 0"	23	20	22	20	18	23	...	...	...	...	...	...	...	...	...	...	...	...	...	124	
998	1' 2"	26	25	18	13	21	20	13	10	...	...	...	...	...	...	...	...	...	...	...	148	
999	1' 1"	24	23	21	21	13	8	8	13	17	...	...	...	...	...	...	...	...	...	...	154	
1000	1' 2"	32	29	31	33	13	14	8	4	...	...	...	...	...	...	...	...	...	...	...	154	

TABLE IV — (Concluded).

SPECIMEN NUMBER.	Diameter of top in inches.	TOP MEASUREMENTS.																Height of stump.	Combined length of logs.	Length of top.	Total height.
		Number of rings per inch at top, counting from the heart outward.																			
929....	9	18	14	10	10	9	8	9										2 8	40	28' 10"	71' 6"
930....	11	12	12	14	9	8	9											3 0	53 4	25' 11"	86 3
931....	8	12	11	10	10													3 1	40 0	26 4	69 5
932....	8	14	13	13	11													3 4	53 4	22 6	79 2
933....	8	11	13	12	12													3 0	6 8	33 7	62 3
934....	9	10	11	13	11	10												4 4	28 8	44 7	75 7
935....	10	14	11	10	10	14												3 2	40 0	33 8	76 10
935....	8	12	14	14	9													2 10	40 0	31 2	74 0
937....	8	18	18	16	14													2 2	28 8	36 7	66 5
938....	8	18	14	15	14													2 4	40 0	26 10	69 2
939....	8	14	16	16	13													3 2	66 8	21 7	91 5
940....	11	12	13	16	14	11												3 1	40 0	29 10	73 11
941....	8	12	14	14	12													2 10	53 4	22 4	78 6
942....	11	12	12	13	14	16	8											3 4	40 0	33 6	76 10
943....	9	14	14	14	13	10												3 0	40 0	31 4	74 4
944....	9	14	10	13	13	11												3 0	40 0	31 0	74 0
945....	11	14	16	14	15	10	10											2 6	40 0	20 4	72 10
946....	12	14	16	14	13	12	12	14										2 10	28 8	49 10	79 4
947....	8	16	12	10	11	12												2 10	26 8	31 4	60 10
948....	9	14	14	11	13	16												3 6	40 0	28 4	71 10
949....	9	18	2	13	13	10												3 2	40 0	26 10	60 0
951....	10	14	12	12	5	11												3 2	53 4	27 9	84 3
951....	13	16	4	14	6	10	11	8										2 10	13 4	50 4	66 6
952....	9	12	16	11	12	9	9											4 0	28 8	28 6	59 2
953....	10	12	16	12	13	11												4 0	13 4	26 4	63 8
954....	10	14	12	14	13	10												3 6	53 4	19 6	66 4
955....	8	14	16	12	10													3 10	28 8	33 2	63 8
956....	8	16	17	9	11													3 4	26 8	30 10	60 10
957....	10	17	19	11	10	9												3 6	28 8	33 3	68 5
958....	8	12	12	14	14													3 2	28 8	33 4	63 2
959....	9	18	11	13	12													2 7	40 0	26 8	69 3
960....	8 1/2	11	14	14	12	13												2 8	40 0	24 10	67 6
961....	8 1/2	14	15	16	10	13												2 10	40 0	29 3	72 1
962....	11	6	9	14	16	15	18											2 6	16 8	43 7	71 9
963....	9	13	11	11	17	14												2 8	40 0	30 3	73 11
964....	12	7	8	16	17	19												3 0	40 0	28 11	71 11
965....	10	14	16	12	19	11												3 0	53 4	28 7	84 11
966....	8	12	12	17	11													2 4	40 0	19 10	62 2
967....	8	14	16	11	9	6												2 10	40 0	26 4	69 2
968....	8	19	14	10	8													2 8	28 8	25 0	54 4
969....	10	9	21	17	12	8												3 0	53 4	21 10	78 2
970....	9 1/2	16	19	11	13	7												3 0	40 0	32 6	75 6
971....	9	10	18	17	11	11												3 1	28 8	35 7	65 4
972....	8	9	7	12	15													2 4	28 8	30 0	59 0
973....	8 1/2	12	16	16	11	8												2 6	28 8	26 9	55 11
974....	9	17	20	13	14	8												2 0	13 4	43 3	57 7
975....	9 1/2	12	19	16	10	10												2 2	28 8	36 10	66 8
976....	9	16	11	15	16	8												2 4	28 8	39 0	68 0
977....	8	14	14	17	11													1 10	40 0	31 2	73 0
978....	8 1/2	14	11	13	13	6												2 4	28 8	36 10	65 10
979....	8	16	11	15	12													2 0	28 8	38 6	67 2
980....	8	16	11	13	14													1 11	28 8	34 9	63 4
981....	8	14	12	18	10													2 2	28 8	33 6	62 4
982....	9	16	12	19	18													2 8	40 0	29 4	72 0
983....	12	21	17	12	14	18	8											2 9	40 0	40 2	82 11
984....	9	19	18	11	16	12												2 4	28 8	30 0	59 0
985....	10	20	14	19	11	10												2 3	40 0	18 6	70 9
986....	12	19	19	12	14	14	10											2 10	40 0	38 3	81 1
987....	8 1/2	16	16	10	15	12												2 6	40 0	34 4	76 10
988....	8	11	9	12	14													1 4	16 8	31 6	59 6
989....	8	14	16	15	12													3 0	28 8	40 4	70 0
990....	8	12	19	13	13													2 10	28 8	23 0	52 6
991....	10	14	16	9	12	14												2 8	28 8	26 10	56 2
992....	8	14	14	19	10													2 9	40 0	27 6	70 3
993....	8	16	12	17	11													1 11	28 8	31 8	60 8
994....	8	14	18	19	8													2 2	13 4	36 0	61 6
995....	9	19	18	14	10													2 4	28 8	34 10	68 10
996....	10	19	21	20	11	11												2 6	40 0	28 6	71 0
997....	9	21	19	17	8													2 0	13 4	51 2	67 6
998....	8	11	17	16	12													2 3	40 0	24 6	66 9
999....	8	12	19	17	14													2 1	28 8	31 4	60 1
1000....	9	16	12	19	20	16												2 0	28 8	38 2	66 10

In connection with the preceding tables it may be stated that all of the 700 trees first examined were found on Township 20, Franklin county, between two large ponds, Floodwood and Long Pond. The two main slopes on this land run north and south, with little or no difference in the timber on either slope. This township has an average elevation of about 1,600 feet above the sea. The spruce was above the average in quantity per acre, and in quality it was first class. The trees were thrifty, but few being found that were rotten at the stump. Not a tree had died within the past ten years, the absence of any dead spruce having been noted by the foresters. In size the trees were above the average diameter for Adirondack black spruce.

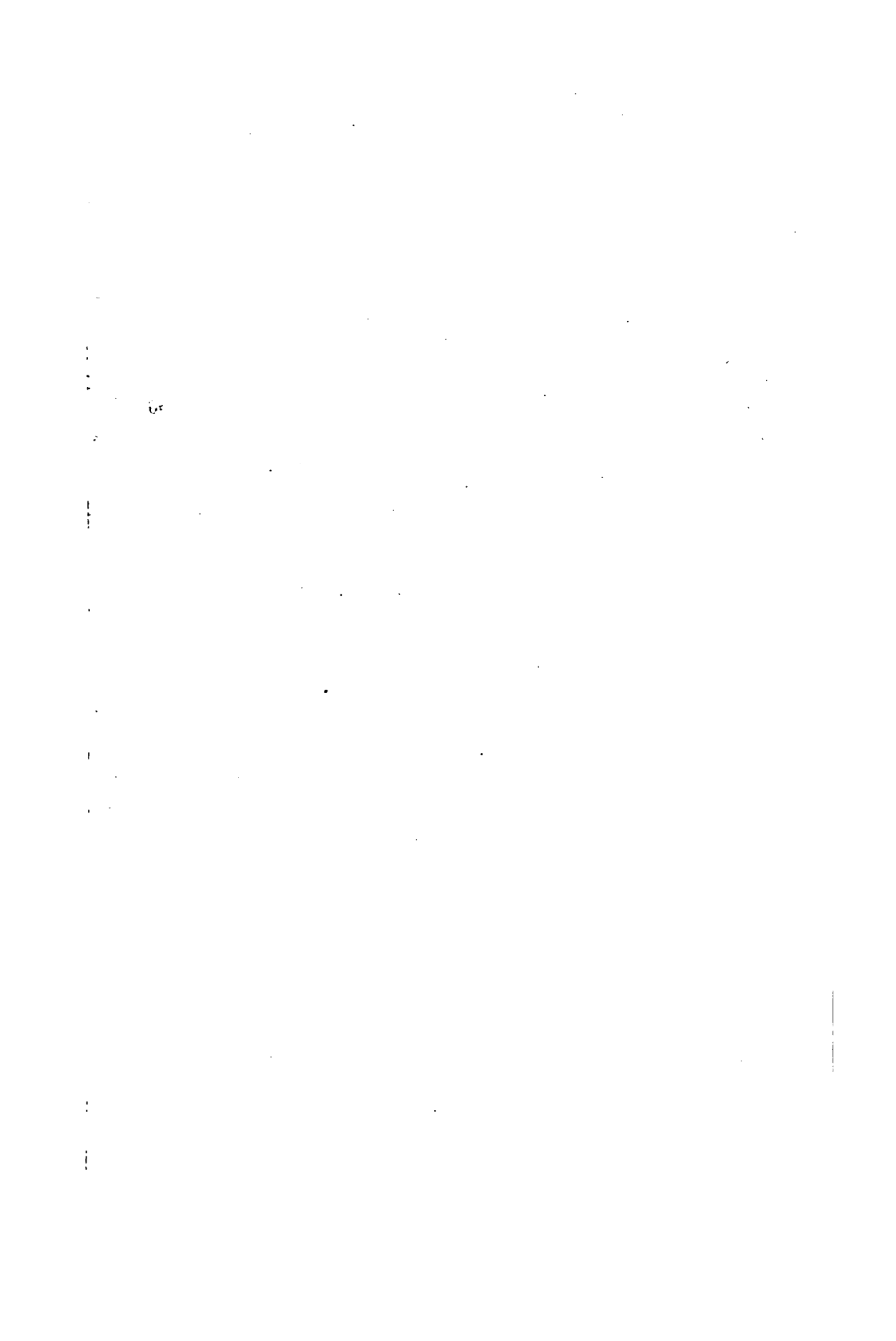
On Township 20, in a few places where the spruce was standing in "clumps," there was a yield of 40 standard logs (8,000 feet, B. M.) per acre; where it was scattered through the other timber, 15 standards (3,000 feet) would be a fair average.

On Lots 34 and 35, Township 3, St. Lawrence county, the spruce growing in clumps measured, in two different places, 35 standard logs (7,000 feet) to the acre. Where it was scattered among other species, it measured 12 standards per acre on an average.

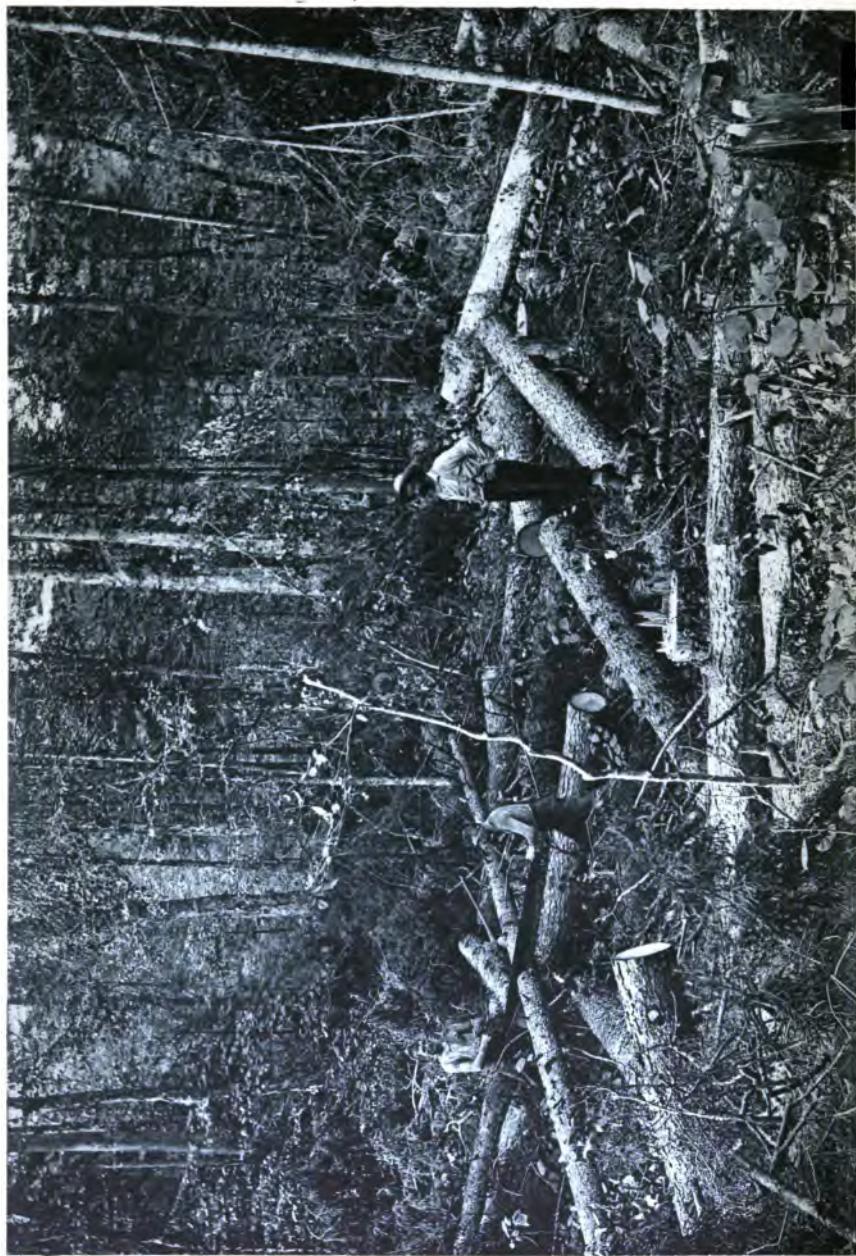
On Lots 50 and 63, Township 3, St. Lawrence county, the spruce did not grow in clumps at all, but averaged 15 standard logs to the acre.

The spruce in each case was growing either in small clumps or was scattered among hardwoods composed of beech, hard maple, and yellow birch, the beech predominating in number of trees, although of inferior diameter and height. The black spruce overtops the hardwoods where its diameter exceeds 14 inches; when standing in clumps it is taller than the scattered spruces of the same diameter growing among the hardwoods. Where it grows in clumps the spruce has a small crown, the limbs being small and short; but in a scattering growth the spruces, as soon as they overtop surrounding hardwoods, put out their limbs thickly and large.

A spruce 20 inches in diameter growing in a clump of spruces will yield five logs, 13 feet 4 inches in length, while one of the same diameter in a scattered growth mixed with hardwoods will yield but four logs. In the one growing among hardwoods, after four logs







G. H. Ribon, Photo.

SAWING FALLEN TREES INTO LOGS.

have been cut from its trunk, the diameter of the last or top log at its small end will be from 10 to 12 inches, but the limbs above this point will be so thick and large that the fifth log would not be over five or six inches at the top, and would not be accepted by the lumbermen. A tree of the same species and size growing in a clump will yield five logs, because the shaft does not diminish in size so fast owing to the lighter growth of limbs that form its top. While the largest spruces are found scattered among the hardwoods, the tallest ones of like diameters are found growing in the spruce clumps.

A coarse, gravelly soil, with a southern or western slope, seems most favorable for the best development of this species. Before the axemen came into this locality there was an ample growth of young spruces or nurslings thickly scattered throughout the timber; but where the spruce grew thickly, the felling of trees scarred and broke down most of the nurslings. Where the spruce was scattered through the hardwoods the young trees did not suffer so much from the careless felling of the axemen.

The spruce blight of twenty years ago did not make its appearance in Township 20, on which the first 700 trees examined were growing. In fact, this locality is remarkable for its exemption from injury in that respect.

There are but few balsams (*Abies balsamea*) growing among the spruces which furnished the specimens examined by the foresters, although many trees of this species are growing along the edges or shores of neighboring swamps and ponds. The balsam in this vicinity is small, ranging from three to seven inches in diameter near the ground. It is very scarce, however, in the vicinity of this spruce growth, there being many acres on which no balsam is found; neither was there any cedar. There are a few tamaracks (*Larix Americana*) on these lots, but they are all dead, having succumbed to the attacks of the sawfly (*Nematus Erichsonii*) which within a few years has destroyed all the tamarack in the Adirondacks. But little white pine was found among the spruce where these measurements were taken. On the north shore of East Pine Pond, there was a piece of timber composed almost wholly of that species,—nice, thrifty, sound timber of large size. The owner, Mr. Snell, said

that he cut 1,000 standards (200,000 feet, B. M.) of white pine logs on less than ten acres of land near the west end of East Pine Pond. There were a few black ash trees scattered throughout the timber where the spruce was growing, but no cherry.

In Township 3, St. Lawrence county, a few elms were growing among the spruces and hardwoods, a species rarely seen in the Adirondack forest.

A noticeable feature in the growth of the black spruce is that the annual accretion of wood in the trunk is not concentric, the total growth being considerably greater on one side of the heart than on the opposite side. The extent of this eccentricity is apparent in some of the figures given in Table IV, in which the diameter of each tree is not only given, but the number of inches and growth per inch of the longest radius. For instance, Specimen No. 1 had a diameter of 18 inches on the stump, but the figures showing the number of annual rings for each inch in growth indicate that instead of nine inches, which would have been one-half the diameter, there were eleven inches between the heart and the bark. Specimen No. 77 is fourteen inches in diameter, but the heart is nine inches from the bark. Specimen No. 135, with a diameter of thirteen inches, shows that there were nine inches between the bark and the heart. In Specimen 237 it will be seen that the heart was two inches nearer one side of the tree than the other. In No. 383 the radius is 17 instead of 12 inches. This lack of concentricity, as measured by the abnormal length of the longest radius, varies from one to five inches.

A remarkable feature of this one-sided growth is that it is mostly in one direction. The foresters who examined the trees in Township 20 were instructed to note carefully the compass point to which in each case the longest radius of tree growth pointed. Of 700 trees examined in Township 20, Franklin county, (the first 700 specimens in Table IV,) this abnormal or one-sided growth was directed as follows :

Direction.	Trees.
North .....	471
Northeast .....	81
East .....	106
South .....	1
West .....	27
Southwest .....	6
Northwest .....	8
	<hr/>
	700
	<hr/>

There seems to be no satisfactory explanation of this tendency of the black spruce to a one-sided growth. After careful observations in search of some reason, no regular conditions of slope, exposure or environment were found upon which to base any theory. It has been asserted frequently, however, that this uneven growth on either side of the heart was due to an uneven distribution of the roots; and that the greater accretion in the tree trunk would be found on the side of the tree on which lay the largest roots.

In the preceding tables the indicated age of the tree is based upon the number of rings revealed by the stump; but in each case if the tree had been cut close to the ground a greater number of rings would have been found and consequently a greater age indicated. This should be borne in mind in connection with the statistics referred to. The stumps varied in height from one to four feet, the height of the stump depending in each case upon the convenience of the axeman and the position in which he stood while at work.

One column of figures in Table IV indicates the length of the section taken by the lumbermen for their logs, and represents one, two, or three logs of 13 feet 4 inches each, that being the length cut by the log-choppers in the Adirondack forests. For instance; in Specimen No. 6 (right-hand page), 26 feet and 8 inches of trunk were taken, showing that two logs were obtained from that tree. Specimen 19 shows that a section of the trunk 40 feet long was removed, from which it appears that this tree furnished three logs; and specimen 60, that 53 feet and 4 inches of

the tree trunk, making four logs, were taken. Specimen 83 shows that five logs aggregating 66 feet and 8 inches were taken, the top log being only eight inches in diameter at the top or small end. In this tree it appears, from the next column of figures, that only 15 feet and 5 inches of top remained, indicating that this tree, which was 84 feet 9 inches high, was not only tall, but cylindrical and free from limbs nearly to its crown. Specimen 87 was 93 feet and 7 inches high, and although taller than the one just mentioned, furnished the same number of logs, the top log, however, being 12 inches in diameter at its small end.

The tallest tree mentioned in Table IV is Specimen 839, which was 98 feet 6 inches high, and 22 inches in diameter on the stump. Specimen 832 was 26 inches in diameter, but only 87 feet 8 inches high, and furnished four logs instead of five. It will be noticed that many of the trees furnished only two logs and some only one, although they were of a fair height. The small number of logs obtained from a tree was due in some instances to rotten butts, or to the fact that there was too great a limb development at the top of the tree, the top measurements indicating in many cases that the trunk diminished in diameter, or "tapered" too rapidly.

In Table IV the figures showing the number of rings per inch indicate that the Adirondack black spruce when growing under natural conditions, where the trees are overcrowded and deprived of light, requires on an average over 24 years for an increase of two inches in diameter; but an examination of the figures shows that many of the trees, which had attained a height enabling them to dominate the surrounding ones, required from six to eight years only to gain two inches. Thus the tree represented by Specimen 43 was 30 years in gaining the third inch of radius while it was only seven years in growing an inch after its crown had reached to where it could gain proper nourishment. Specimen 456 evidently had the advantage of light and air from the time that it was a nursling, as is indicated by the comparatively small number of years required in adding each inch to its diameter.

From the measurements and notes made by Forester Humes — in Township 14, Town of Fine, St. Lawrence county — the following deductions as to the average age of the spruce are made:

TABLE V.

DIAMETER IN INCHES.	Number of trees.*	Maximum and minimum ages.	Average age.
13 .....	10	138—200	173
14 .....	9	145—275	181
15 .....	4	174—203	184
16 .....	5	167—201	183
17 .....	6	156—200	183
18 .....	4	173—200	184
19 .....	23	184—283	211
20 .....	15	189—289	212
21 .....	15	199—291	246
22 .....	19	107—345	248
23 .....	16	189—300	266
24 .....	19	178—301	270
25 .....	29	195—302	270
26 .....	15	231—354	285
27 .....	18	258—316	288
28 .....	7	271—301	281
29 .....	7	273—333	304
30 .....	5	275—325	299
31 .....	4	231—293	272
32 .....	1	290—...	290
33 .....	1	285—...	285
34 .....	3	302—374	330
36 .....	2	326—351	338
	237		

\* These trees do not represent any definite area or yield per acre, but were selected with reference to securing specimens of each diameter.

And from the measurements and notes made by Foresters Olmstead and Sanford in Township 20, Franklin county, and Township 3 ("Atherton"), St. Lawrence county, the following deductions as to the average age of the Adirondack spruce are made:

TABLE VI.

DIAMETER IN INCHES.	Number of spruce trees.	Minimum and maximum ages.	Average age.
12 .....	217	96—185	128
13 .....	177	102—210	139
14 .....	187	104—214	143
15 .....	71	114—217	151
16 .....	113	116—212	154
17 .....	53	121—236	161
18 .....	77	130—209	154
19 .....	17	95—200	174
20 .....	53	133—235	184
21 .....	4	156—227	185
22 .....	12	162—224	189
23 .....	4	149—234	186
24 .....	10	160—226	195
25 .....	1	213—...	213
26 .....	1	197—...	197
27 .....	3	217—226	222
	1,000		

We are unable to account satisfactorily for the difference in average age as indicated in the two preceding tables. It may be that if the figures in the first had included as large a number of trees and as wide a scope of territory as are embraced in the second table, that the two results would agree better. The average age as indicated in Table V corresponds substantially with that of the black spruce in Maine, as based upon measurements made by Mr. Austin Cary, whose report shows that the average age of the 12-inch spruce is 171 years; the 13-inch, 174 years; the 14-inch, 189 years, and the 15-inch, 185 years.

A remarkable feature in connection with the biology of the spruce is the exceedingly wide range of ages in trees of the same diameter. Thus, in Table VI it will be noted that of 187 trees all 14 inches in diameter on the stump, there is a difference of 110 years in some of the ages. Some will readily explain this







G. H. Etson, Photo.

SKIDDING LOGS.

wide divergence by claiming that in many cases there were two or more rings formed in single years owing to climatic effects, which is discussed later on.

But, in view of the short season in the Adirondacks during which the flow of sap is not checked, as might occur in trees which feel the influence of an early spring, only one ring could reasonably be expected for each year's growth. It is more reasonable to account for the rapid growth of some of the trees by the fact that these trees stood where they received more light and air; and for the slow growth of the others by the deprivation of the same.

Although the black spruce is the slowest in growth of all our forest trees, it does not require the number of years to attain maturity that are indicated by the preceding statistics. It must be borne in mind that these tables indicate the age of the spruce when growing under natural conditions, where it is deprived of a proper amount of light and air during the greater period of its growth. Starting as a seedling, the young tree struggles for many years in the cold and gloom of the underbrush, the first decade of its existence being merely a struggle for survival. This is evident from the figures in Table IV, in which so many trees show that over 30 years were passed in attaining their first inch of radius or two inches of diameter. Only through the survival of the fittest do these nurslings struggle upward until by overtopping the surrounding growth they gain light and air, after which their increase in rapidity of growth is plainly noticeable.

Now the black spruce of the Adirondacks does not require any such number of years to attain a merchantable size. On Lot 94, Township 21, in the Town of Long Lake, Hamilton county, there is at the present time a thick growth of spruce on a piece of land where the Rev. Robert Shaw, a local clergyman, according to his statement, mowed grass 26 years ago. Many of the trees in this clump of spruce are over 30 feet high and nine inches in diameter. Emerson\* mentions seven spruce trees of 31 years' growth, in the Botanic garden, which averaged 30 inches in diameter, or one-third of an inch annual growth in diameter.

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\* Trees and shrubs of Massachusetts, by George B. Emerson.

In the office of the Forest Commission there are some carbon paper impressions showing growth rings taken from the stumps of spruce trees recently cut by lumbermen — trees which were growing in a spruce forest that had been lumbered 24 years ago, at which time all the larger spruce was taken out. The accelerated growth of the young spruces which were left, due to the admission of light and air through the removal of the large trees, is plainly seen in the wider rings shown by the carbon impressions taken from the stumps. Up to and just preceding the time when the lumbermen first went into this forest these spruces were growing at a rate of 26 rings to the inch. Immediately after this thinning and interlucation there was an increased growth, as shown by the impression paper, at the rate of 11 rings to two inches.

We regret exceedingly that we are unable to reproduce in print these impression papers of tree rings so as to furnish them with this publication, for they argue plainly and incontestably as to the increased product and revenue which can be derived from our spruce forests where the cutting is done under an intelligent system.

That the number of rings disclosed by the cross-section of a tree-trunk indicates the years of age is a generally accepted fact. It is so taught in all text-books pertaining to the subject. Asa Gray states that "the trunk of an exogenous tree, when cut off at the base, exhibits as many concentric rings of wood as it is years old."

Emerson\* says of these tree rings that "a single circle attains maturity, in temperate regions, every year."

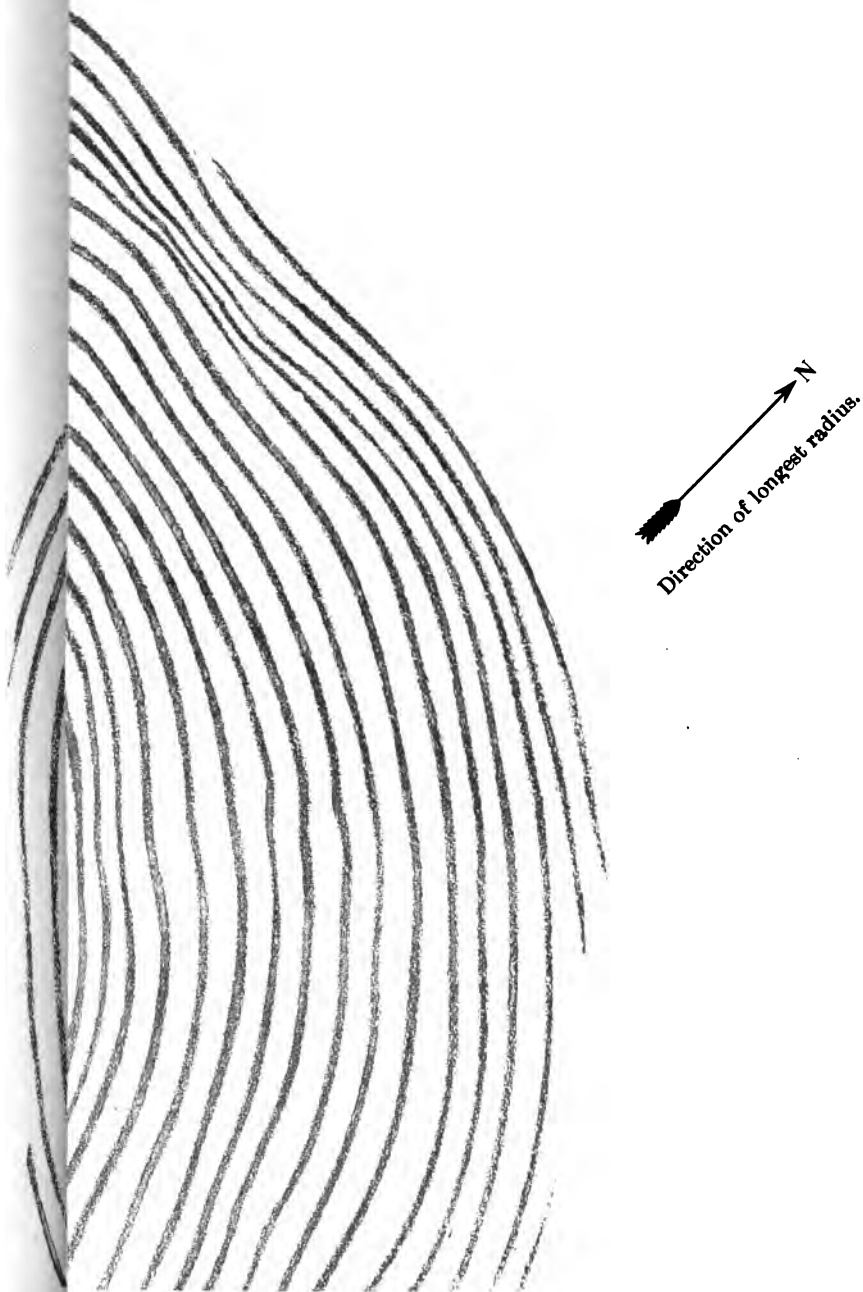
Goodale† states that this "development of the film of growth is usually continuous in a given season, but it may be interrupted, in which case it is possible to have two rings added to the wood in a single year, whereas, *as everyone knows, there is usually only one new ring for each year's growth.*"

The "interrupted" growth just referred to is the result of a period of cold weather acting upon trees which in the same season have felt previously the influence of an early spring. But in

\* Trees and shrubs of Massachusetts, by George B. Emerson.

† Garden and Forest, Vol. II, March 30, 1889: Principles of Physiological Botany, as applied to Forestry; by George Lincoln Goodale.

cross-section of Black Spruce, 115 years old, 12 inches in diameter on the stump. From an impression made with carbon paper. The greater thickness of the outer rings is due to interlucation made by lumbermen eighteen years ago.



Albany Eng. Co.



the cold, backward climate which prevails in the habitat of the Adirondack spruce there is no early spring, and no premature starting of the sap or liability to such interruptions. In that region spring is late in coming, and barely ushers in the summer.

Hough \* says: "The record of the seasons for a long period may be determined, at least in effect, by the width of the rings of annual growth. We sometimes find, at recurring intervals, a narrow ring, perhaps every third year, that may have been caused by the loss of leaves from worms that appear at that interval, and that have thus left their record when every other proof of their presence has perished. We have seen sections of trees in the museums of Schools of Forestry, in which these proofs were recorded through a century or more of time, and the years could be definitely fixed by counting inward from the year when the tree was felled.

"When the bark and wood of a tree are cut or wounded by accident, as by the marking hammer of the forester, or the axe of a surveyor, the growth from the side will gradually close over the injury, and fill in the inequalities, so that, when afterward split off, it will often show in relief any depressions or cuts on the original trunk. Many Forest Academies in Europe have in their museums specimens of timbermarks thus cut or stamped into wood, with the cast taken by nature from the mold. The landmarks of surveyors have thus been found more than a hundred years afterward. Some scar, or, in coniferous trees, perhaps a gum spot, would be noticed upon the outside, and by cutting down through as many rings of growth as there had been years since the former survey, the marks of the ax would be found."

It is no new idea. Over 400 years ago, Leonardo da Vinci, who was an observant botanist as well as a great painter, wrote: "The rings of the branches of trees show how many years they have lived, and their greater or smaller size whether they were damper or drier. They also show the direction in which they were turned, because they are larger on the north side than on the south, and for this reason the center of the tree is nearer the bark on the south than on the north side."

But these statements need not rest upon any botanical theory. In the course of our work we have often found it necessary to

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\* Elements of Forestry, by Franklin B. Hough, Ph. D.

† *Il Nuovo Giornale Botanico Italiano*: Vol. I, No. 1, 1869.

re-establish the old boundary lines of various townships in the Adirondack forest. The surveyors have repeatedly cut blocks out of line trees in which the old original "blaze" was grown over with wood and hidden from sight; but the number of tree rings outside the original but concealed scar of the blaze mark corresponded exactly with the number of years which had elapsed since the time when the surveyors first ran the line. This curious and interesting phenomenon has been observed so often in the course of our work that it has ceased to attract attention as a novelty. Many suits involving the title to or possession of land have been decided in courts on the evidence of some surveyor who proved the date of an old survey by introducing as evidence a block of wood cut from a line tree.

In view of the general belief that the annular grains of tree growth are coincident in number with the years of age, it is interesting to note that this idea is strongly combated by some careful observers. While we do not agree with the conclusions in the following article, it is reproduced here as an interesting contribution to the literature pertaining to this subject. The article is reprinted from the *Saw-Mill Gazette* :

#### GROWTH RINGS ON TREES.

*Age said not to be indicated by them.*

"There is an old landmark on the DeLarm farm that is of considerable interest. The farm is located on what is known as the 'high road' to DuBois from Reynoldsville. The landmark, which is a notch in a tree, locates a corner of the DeLarm farm, which is in Jefferson county. The landmark also locates the boundary line between Jefferson and Clearfield counties. When the notch was cut Clearfield and Jefferson counties had not been organized, and the line ran between two other counties. The line still remains, though it does not now mark the boundary of either of the original counties. The notch was cut into the tree in 1785, just 108 years ago. This fact is proven by the rings in the tree that are visible and which number 108. Sometimes parts of a tree containing a notch similar to this one, establishing a corner, are taken into court and are accepted as evidence. The date, designated by the number of rings, is also accepted."—*Reynoldsville Volunteer*, Pa.

"The above item is from a recent copy of a Pennsylvania journal, and serves to show how tenaciously man clings to old fallacies. Of all silly notions this idea of rings being an indicator of the age of trees seems to be most senseless, and yet, according to the above authority, the rings of a tree are accepted as evidence in courts.

If the determining of the age of a tree by the rings was one of those things that was difficult to controvert, then there might be some excuse for depending upon them, but when there are so many opportunities at hand to disprove the theory, to adhere to the fallacy is worse than ignorance—it becomes a species of bigotry.

Just how the notch proves what is asserted is not made clear, as any cut into the side of a healthy tree is sure to fill up by the outer growths after a series of years, but somewhere the authority for the statement found 108 rings, and forsooth the notch was cut 108 years ago; logic, and as a matter of course, "a horse chestnut must be a chestnut horse."

Had a section from an opposite side of the tree been cut there would have been found, without doubt, another number of rings, either less or more, or had the count been several feet above the notch the number would have been less, or below it a short distance there would have been found a greater number.

If the believers in the rings are to tell us the age of a tree thereby, they must settle just at what point the count is to be made for beginning at the ground and going upwards, it is found that the number of rings grows less as you ascend. This must be so from the natural course of things, as new shoots put out from the top and continue the upward growth of the tree every year. We can see no way out unless we make our count at the ground, but here even we encounter another difficulty, and one that is serious, if the tree should be one that has grown where one side is fully exposed to the sun and the other shaded. In that case, counting from the heart, it will be found that on the exposed side of the tree the number of rings is greatly in excess of the number on the shaded side.

A notable case is called to mind of a second-growth white ash that grew in a hedge on the south side of a fence. This tree showed forty clearly defined rings upon the south side of the heart, and, by a liberal allowance, after examining with a magnifying glass, thirty was the most that could be defined on the north side, so that it was just as easy to prove the tree thirty as it was to prove it forty years old. The same butt was cut off eight feet above the cutting kerf, and the number of rings had been reduced to twenty and sixteen. Curiosity led to a further examination and the stump was cut close to the ground, where no difficulty was experienced in counting sixty and forty-five rings, respectively.

A further proof was furnished by the recorded facts of the fence having been erected on that line thirty-five years before, as a boundary line between the estates of two brothers, being a part of a plot that was divided up between heirs, and the tree grew after the fence was built. Of course, such a case would not count against the prejudices of ages, but it becomes a stubborn fact, nevertheless.

Let anyone plant a number of seed—apple, peach or plum, something that grows quickly—care for the sprouts, and after three or four years cut them and count the growth-rings and thus satisfy himself. It is doubtful if two out of a dozen will contain the same number of rings, or if anyone will show a number corresponding with the age. The thriftier the shoot the greater the number of rings, and the more stunted and weak the specimen the less the number, and yet all may be of the same age and grown under similar conditions.

All roots, those used for food as well as those that are not, are of a woody nature, and where the circumstances are unfavorable the least thrifty of the edible show a fibrous, woody composition, and at times some are found that can not be cooked to make them fit for food. In all the growth rings are defined, but in none so clearly as in the beet. Not only does it show the rings, but it shows the porous state and medullary rays as well. These rings neither indicate days, months, moons or other time divisions. On a tender, thrifty root there may be a dozen or more rings, while a less thrifty one grown at its side may not show half that number. What will our seer tell us regarding the ages of these beets?

Leaving all other tests aside, there is a law of nature that upsets all this annular ring growth theory. Everything has its growing, ripening and decaying season. The tree, like the straw of wheat, grows to its full, ripens and then dies. A tree may be vigorous and put on wood, or, in other words, grow for one hundred years, but that hundred years does not mark its life; for fifty or even a hundred more years the life sap may be sufficient to nourish and maintain the growth already made, but not enough to put on new wood, and another fifty or hundred years may pass, during which no new growth is made, and during which the vital fluid is sufficient to maintain the tree in full vigor, during which it slowly but surely dies. Here may be three hundred years of life, and yet, during two hundred years, not an ounce of new wood has been added, and yet, in face of all, men will assert that they can determine the age of a tree by its rings.

What, then, are these rings and what do they determine? The common-sense answer is, they are growth rings—nothing more. One may be the result of a year, a month or a week or any other division of time; all depends upon circumstances. If an entire summer has been moist



and vegetation has suffered no drawback from drouth or cold, it is barely possible that the entire growth of that season will be represented by a single ring, but even this is doubtful, as it is the thin sap which flows nearest the bark that nourishes the growth, and if an extra large growth is formed the sugar and glutinous matter in the sap may thicken and impede the flow of the more watery portion, and by forcing it into the new inner bark cause a new growth; but if, after a growing period, there comes a drouth sufficient to rob the roots of the necessary moisture, the sap in the wood thickens and the more watery seeks the inner bark, through which it carries nourishment to the leaves. This is often insufficient, and many leaves fall and others wilt, but with a fall of rain the supply of vital fluid is increased, the leaves brighten up and the smaller ones grow. New life is imparted, and with this new life comes a new growth, another ring is formed, and so on through the entire season. Who living in the north has not seen the leaves nipped by a frost after they were full and fall to the ground? After a few warm days and a warm rain new leaves start and the tree is soon in full foliage, but there has been a check to growth and a new growth starts with the new leaf. Thus, one cause another checks one growth and invites another, making a ring each time entirely independent of years."—*Saw-Mill Gazette*.

Mr. Austin Cary, of Bangor, Me., who, acting under instructions from the National Forestry Bureau, has been engaged in the Maine forests in counting tree rings with a view to establishing the age of the black spruce in that State, calls attention in his report to certain facts which throw some light on this matter of variable or retarded tree growth:

"While carrying out the field work, which is behind all these statements, facts were found proving the influence of the weather on the growth of trees. In May, 1893, while at work on the Androscoggin river, word came from Mr. J. A. Pike, of Berlin, N. H., that record was to be seen in the spruces of a series of cold years which occurred in the early part of the century. This was richly worth examination, and I immediately set about investigating the matter. Beginning the count of rings with the bark, it was found on the first log examined that a number of rings, being in that case the seventy-ninth to the eighty-third from the bark, were very distinctly thinned. Continuing the search, every tree was found to have a belt of thin rings in substantially the same position, these being reduced in some cases almost to microscopic.

"As soon as access could be had to books the history of the matter was looked up, and it was found that the years 1812 to 1816 in Maine were very extraordinary years. The temperature was unusually low as an average, and in 1812, 1815 and 1816, at least, frosts or snows or both occurred in the summer. In 1815 and 1816 crops through the State were very seriously impaired, and many people despairing of the agricultural prospects of the

country emigrated to the Ohio valley. This severe weather then was without doubt the cause of the thin rings so regularly found in the spruce trees.

"Since that time this zone of rings has been found in spruce trees in all parts of the State and in the northern portion of New Hampshire. Careful notes of its character and occurrence were taken, in the course of other study, and the facts observed and inferences drawn will be found in full in the publications of the United States Forestry Division.

"This belt of thin rings can be seen by anyone who will take the trouble to examine carefully any good sized spruce log. It demonstrates the effect of inclement seasons on the growth of trees, and it is further of value in that while there is some variation about it, the approximate regularity of its position, the close correspondence in number of the rings outside the thin belt with the seasons that have elapsed since the cold year, gives added confidence in the substantial regularity of ring deposit and consequently in the results of investigation which proceed on that assumption.

"An instance of the effect of exposure on the growth of trees I am able to present through the interest of Mr. William Monroe, of Bangor. In the winter of 1893-94 he scaled\* a landing of spruce hauled into Silver lake in the Town of Katahdin Iron Works, from a piece of ground on the south slopes of Saddle Rock Mountain, which had never before been cut. The soil was a deep red loam, and the spruce was gathered along brook runs or scattered amongst the hardwood growth intervening. But the point is that the timber was divided between two separate slopes of the mountain, the upper one of which was some 200 feet above the lower, and considerably more exposed.

"The timber from each slope was yarded on the more level land at its base, and Mr. Monroe kept a separate scale of the two lots. A marked difference in the size of the trees is found. The logs cut on the upper and more exposed slope were 4,377 in number, and scaled 435,726 feet, B. M., or  $99\frac{1}{2}$  feet to the piece. The lower lot numbered 2,598 sticks, and the total scale was 320,811 feet, or  $123\frac{1}{2}$  feet to the piece. The difference is 24 per

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\* Measured.

cent. of the smaller piece. No other cause for it being apparent, the difference in the size of the trees seems to be due to their greater or less exposure."

#### FOREST COMPOSITION.

Throughout the entire forest, covering the Adirondack Plateau, where the altitude exceeds 1,300 feet, the hardwood growth accompanying the black spruce is in almost every locality made up of maple, beech and yellow birch. Here and there, but at widely separated intervals, are scattering specimens of the white and black ash, black cherry, elm, basswood, "hard-hack"\* (*Ostrya Virginica*), and white birch. On burned areas or reforested clearings the poplars and "pin" cherries (*Prunus Pennsylvanica*) grow in abundance, but are seldom seen growing with the spruce in the primeval woods.

In order to give some idea of the general composition of the Adirondack woods, the foresters were directed to measure off in different places an acre or more of ground and count each tree within the space, noting, also, its diameter and species. They were further instructed to take pains that the localities selected should be ones in which the growth had no unusual characteristics, and which would fairly represent the number and proportion of the various species per acre.

Foresters Olmstead and Sanford accordingly selected four acres on Lot 39, Township 20, Franklin county, in the immediate vicinity of the forest in which they examined the trees embraced in the first 700 specimens of Table IV. These four acres are situated about four miles west of the head of the Upper Saranac Lake, and near the line of the Adirondack division of the New York Central railroad. Their notes do not embrace the young trees of seven inches in diameter or less, of which there was the usual proportion standing among the others. The undergrowth, like that of all the Adirondack forests, was somewhat dense, being composed largely of "witch hopple" (*Viburnum lantanoides*) and striped maple (*Acer Pennsylvanicum*). The mountain maple (*Acer spicatum*) was not plentiful, this species apparently seeking the roadsides or openings.

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\* Local, for iron-wood.

TABLE VII.

ACRE No. 1.

*Lot 39, Township 20, Franklin County.*

DIAMETER.	Spruce.	Hemlock.	Balsam.	Birch.	Maple.	Beech.	
8 inches .....	20	8	2	.....	1	22	53
9 " .....	6	5	1	.....	.....	7	19
10 " .....	8	2	2	1	4	13	30
11 " .....	4	1	.....	.....	1	5	11
12 " .....	4	4	1	1	8	11	29
13 " .....	7	.....	.....	.....	3	3	13
14 " .....	1	.....	.....	2	2	3	8
15 " .....	.....	.....	.....	2	.....	.....	2
16 " .....	.....	.....	.....	2	5	4	11
17 " .....	.....	.....	.....	.....	.....	.....	.....
18 " .....	.....	.....	.....	.....	2	2	4
19 " .....	.....	.....	.....	.....	.....	.....	.....
20 " .....	1	1	.....	3	4	.....	9
21 " .....	.....	.....	.....	.....	.....	.....	.....
22 " .....	.....	.....	.....	.....	1	.....	1
23 " .....	.....	.....	.....	.....	.....	.....	.....
24 " .....	.....	1	.....	1	.....	.....	2
25 " .....	.....	.....	.....	.....	.....	.....	.....
26 " .....	.....	.....	.....	.....	.....	.....	.....
27 " .....	.....	.....	.....	.....	.....	.....	.....
28 " .....	.....	.....	.....	1	.....	.....	1
	51	22	6	13	31	70	193

Average diameter, including eight inches and upwards : —  
 Spruce, 10 inches; hemlock,  $10\frac{1}{2}$  inches; balsam,  $9\frac{1}{2}$  inches;  
 yellow birch,  $17\frac{1}{4}$  inches; maple,  $14\frac{1}{4}$  inches; beech,  $10\frac{1}{2}$  inches.

TABLE VIII.

ACRE No. 2.

*Lot 39, Township 20, Franklin County.*

DIAMETER.	Spruce.	Hemlock.	Balsam.	Birch.	Maple.	Beech.	Total.
8 inches . . . . .	18	13	5	1	.....	16	53
9 " . . . . .	3	3	2	.....	.....	2	10
10 " . . . . .	7	4	.....	3	.....	8	22
11 " . . . . .	6	2	.....	.....	2	2	12
12 " . . . . .	5	11	1	3	1	10	31
13 " . . . . .	5	2	.....	3	.....	.....	10
14 " . . . . .	3	3	.....	2	3	1	12
15 " . . . . .	1	.....	.....	.....	.....	.....	1
16 " . . . . .	1	1	.....	.....	2	1	5
17 " . . . . .	1	.....	.....	.....	1	.....	2
18 " . . . . .	3	.....	.....	1	.....	.....	4
19 " . . . . .	.....	.....	.....	.....	.....	.....	.....
20 " . . . . .	.....	.....	.....	2	.....	.....	2
	53	39	8	15	9	40	164

Average diameter, including eight inches: Black spruce,  $10\frac{1}{4}$  inches; hemlock,  $10\frac{3}{8}$  inches; balsam,  $8\frac{1}{4}$  inches; yellow birch,  $13\frac{1}{4}$  inches; hard maple,  $13\frac{3}{8}$  inches; beech,  $9\frac{1}{10}$  inches.

TABLE IX.

ACRE No. 3.

*Lot 39, Township 20, Franklin County.*

DIAMETER.	Spruce.	Hemlock.	Balsam.	Birch.	Maple.	Beech.	Total.
8 inches	18	15	2	1	.....	25	61
9 " " " " " " " "	6	.....	.....	.....	.....	.....	6
10 " " " " " " " "	17	10	.....	2	1	10	40
11 " " " " " " " "	5	2	1	.....	.....	3	11
12 " " " " " " " "	14	6	.....	8	2	6	36
13 " " " " " " " "	6	.....	.....	1	.....	.....	7
14 " " " " " " " "	11	2	.....	3	1	3	20
15 " " " " " " " "	1	1	.....	2	.....	.....	4
16 " " " " " " " "	2	.....	.....	2	.....	3	7
17 " " " " " " " "	.....	.....	.....	1	.....	.....	1
18 " " " " " " " "	.....	1	.....	2	2	.....	5
19 " " " " " " " "	.....	.....	.....	.....	.....	.....	.....
20 " " " " " " " "	.....	.....	.....	.....	.....	.....	.....
21 " " " " " " " "	1	.....	.....	.....	.....	.....	1
22 " " " " " " " "	1	1	.....	.....	1	.....	3
23 " " " " " " " "	.....	.....	.....	.....	.....	.....	.....
24 " " " " " " " "	1	2	.....	.....	2	.....	5
29 " " " " " " " "	.....	1	.....	.....	.....	.....	1
33 " " " " " " " "	.....	1	.....	.....	.....	.....	1
	83	42	3	22	9	50	209

Average diameter, including eight inches: Black spruce,  $11\frac{1}{2}$  inches; hemlock,  $12\frac{1}{4}$  inches; balsam, 9 inches; yellow birch,  $13\frac{1}{2}$  inches; hard maple,  $17\frac{1}{2}$  inches; beech,  $9\frac{1}{2}$  inches.

TABLE X.

ACRE No. 4.

*Lot 39, Township 20, Franklin County.*

DIAMETER.	Spruce.	Hemlock.	Balsam.	Birch.	Maple.	Beech.	Total.
8 inches .....	14	9	1	1	.....	5	30
9 " .....	.....	.....	.....	.....	.....	.....	.....
10 " .....	9	4	1	1	.....	5	20
11 " .....	5	.....	.....	.....	.....	2	7
12 " .....	11	4	.....	4	1	5	25
13 " .....	4	.....	.....	1	.....	.....	5
14 " .....	6	2	.....	1	.....	4	13
15 " .....	3	.....	.....	1	2	2	8
16 " .....	.....	.....	.....	3	1	4	8
17 " .....	2	.....	.....	.....	.....	.....	2
18 " .....	4	.....	.....	.....	1	.....	5
19 " .....	.....	.....	.....	.....	.....	.....	.....
20 " .....	.....	.....	.....	2	1	.....	3
21 " .....	1	.....	.....	.....	1	.....	2
22 " .....	1	.....	.....	.....	.....	.....	1
23 " .....	.....	.....	.....	.....	.....	.....	.....
24 " .....	.....	.....	.....	.....	.....	1	1
28 " .....	.....	1	.....	.....	.....	.....	1
33 " .....	.....	1	.....	.....	.....	.....	1
	60	21	2	14	7	28	132

Average diameter, including eight inches: Black spruce,  $11\frac{2}{10}$  inches; hemlock,  $11\frac{1}{2}$  inches; balsam, 9 inches; yellow birch, 14 inches; hard maple,  $16\frac{1}{2}$  inches; beech,  $12\frac{1}{2}$  inches.

The trees noted in the next table were counted and measured by Foresters Olmstead and Sanford on an acre located on Lot 31, Township 19, Town of Altamont, Franklin county. On this acre all trees above four inches in diameter were included in the forester's notes. Although in a different township and several miles to the westward it will be noticed that the composition of this piece of forest is essentially the same as that shown in the four preceding tables.

TABLE XI.

ACRE No. 5.

*Lot 31, Township 19, Franklin County.*

DIAMETER.	Spruce.	Hemlock.	Balsam.	Birch.	Maple.	Beech.	Total.
5 inches .....	21	1	13	.....	1	1	37
6 " .....	7	3	6	1	.....	2	19
7 " .....	7	2	4	.....	.....	1	14
8 " .....	15	1	12	.....	1	14	43
9 " .....	.....	.....	.....	.....	.....	.....	.....
10 " .....	13	2	.....	3	.....	5	23
11 " .....	2	1	.....	.....	.....	2	5
12 " .....	9	4	2	1	2	15	33
13 " .....	.....	1	.....	.....	.....	4	5
14 " .....	3	4	.....	1	1	3	12
15 " .....	.....	1	.....	.....	.....	1	2
16 " .....	11	4	.....	4	2	2	23
17 " .....	.....	.....	.....	.....	.....	.....	.....
18 " .....	8	2	.....	.....	.....	1	11
19 " .....	.....	.....	.....	1	.....	.....	1
20 " .....	.....	.....	.....	2	.....	.....	2
21 " .....	.....	1	.....	.....	.....	.....	1
22 " .....	3	.....	.....	.....	1	.....	4
23 " .....	.....	.....	.....	.....	.....	.....	.....
24 " .....	2	.....	.....	1	1	.....	4
	101	27	37	14	9	51	239

Average diameter, including five inches: Black spruce,  $10\frac{4}{10}$  inches; hemlock,  $12\frac{1}{2}$  inches; balsam,  $6\frac{1}{2}$  inches; yellow birch,  $14\frac{2}{10}$  inches; hard maple,  $14\frac{1}{2}$  inches; beech,  $10\frac{3}{8}$  inches.

The general composition of the Adirondack forest is fairly represented by the species shown in the five preceding tables. But in traveling through the wilderness exceptional forest tracts will be often noted. In some localities, as shown in Table XII, the hemlock predominates, and the spruce is of secondary importance. In others the white pine, which has nearly disappeared from the Adirondacks, is still to be found. Then, again, in some places only one of the three dominant hardwoods is growing.

In illustration of these exceptional types of timber land we furnish here some tables based on notes and measurements made by Forester Frank C. Parker, who was instructed to examine certain tracts in Essex county.



TABLE XII.

ACRE No. 1.

*Lot No. 12, Roaring Brook Tract, Essex County, N. Y.*

SPECIES.	Trees.	Diameters in inches.	Standards *	Feet, B. M.	Cords.
Black Spruce ( <i>Picea nigra</i> )	11	12—16	6.90	1,262	2
Hemlock ( <i>Tsuga Cana- densis</i> ).....	35	12—40	92.00	16,836	.....
Yellow Birch ( <i>Betula lutea</i> )	6	8—30	.....	.....	.....
Hard Maple ( <i>Acer sacchar- inum</i> ).....	5	19—28	.....	.....	.....
Beech ( <i>Fagus ferruginea</i> ).	36	10—24	.....	.....	.....
Basswood ( <i>Tilia Ameri- cana</i> ).....	1	20—	.....	.....	.....
Totals .....	94	.....	98.90	18,098	2

NOTES.—This acre was selected in a virgin forest, situated on a gentle slope, well watered, with an easterly exposure. Ground slightly rolling. A fair type of forest in which the hemlock predominates. The altitude is about 1,700 feet. The land is owned by the State.

TABLE XIII.

ACRE No. 2.

*Lot No. 12, Roaring Brook Tract, Essex County, N. Y.*

SPECIES.	Trees.	Diameters in inches.	Standards.	Feet, B. M.
Black Spruce ( <i>Picea nigra</i> ).....	11	8—17	4.55	832
Hemlock ( <i>Tsuga Canadensis</i> )....	7	16—28	12.08	2,210
Balsam ( <i>Abies balsamea</i> ).....	10	7—16	2.96	541
White Cedar ( <i>Thuja occidentalis</i> )	13	10—20	9.13	1,671
Yellow Birch ( <i>Betula lutea</i> ).....	38	10—21	.....	.....
Beech ( <i>Fagus ferruginea</i> ).....	7	12—20	.....	.....
Totals .....	86	.....	28.72	5,254

NOTES.—On high land with an easterly exposure. The surrounding forest has the appearance of having been burned over at some previous time, many years ago. The original field-notes pertaining to the survey of this lot call for a corner on a burned hill. This corner is only a short distance from the strip on which these measurements were made. The hardwood has the appearance of a second growth, and some of the larger ones show the effects of fire.

\* A "standard" log is 13 feet long and 19 inches in diameter at the smallest end, inside the bark, and contains 183 feet of lumber, board measure. In the Adirondack forests the lumbermen cut all their logs 13 feet long.

TABLE XIV.

ACRE No. 3.

Lot No. 12, Roaring Brook Tract, Essex County, N. Y.

SPECIES.	Trees.	Diameters in inches.	Standards.	Feet, B. M.	Cords.
Black Spruce ( <i>Picea nigra</i> ).	28	8—21	21.54	3,942	6
Hard Maple ( <i>Acer saccharinum</i> ) .....	47	10—28	.....	.....	.....
Beech ( <i>Fagus ferruginea</i> ).	43	7—21	.....	.....	.....
Totals .....	118	.....	21.54	3,942	6

NOTES.—This acre is a primitive forest in which the hardwoods predominate. It is on a piece of table land, well watered from slopes on either side. The maples and beeches are thrifty and tall, this acre being a good type of an Adirondack forest in which there is a good growth of spruce intermixed among the hardwoods. The undergrowth is composed largely of Mountain Maple (*Acer spicatum*) and small Yellow Birch.

TABLE XV.

ACRE No. 4.

Lot No. 12, Roaring Brook Tract, Essex County, N. Y.

SPECIES.	Trees.	Diameters in inches.	Standards.	Feet, B. M.	Cords.
Black Spruce ( <i>Picea nigra</i> ).	73	9—18	37.00	6,771	12
Hemlock ( <i>Tsuga Canadensis</i> ) .....	3	12—30	9.98	1,826	.....
White Cedar ( <i>Thuja occidentalis</i> ) .....	46	9—22	18.24	3,338	.....
White Pine ( <i>Pinus strobus</i> ).	12	24—37	101.55	18,583	.....
White Birch ( <i>Betula papyracea</i> ) .....	11	8—16	.....	.....	.....
Totals .....	145	.....	166.77	30,518	12

NOTES.—This acre represents a portion of virgin forest situated on rising ground, well watered, a small brook running through a portion of it. The slope has a westerly exposure. It is a fair example of the ridges on which the spruce predominates, and where it grows in company with other conifers.

TABLE XVI.

ACRE No. 5.

Lot No. 12, Roaring Brook Tract, Essex County, N. Y.

SPECIES.	Trees.	Diameters in inches.	Standards.	Feet, B. M.	Cords.
Black Spruce ( <i>Picea nigra</i> ).	36	9—20	15.49	2,834	4
Hemlock ( <i>Tsuga Cana-</i> <i>densis</i> ).....	40	8—26	17.37	3,178	.....
White Cedar ( <i>Thuja occi-</i> <i>dentalis</i> ).....	6	9—26	6.60	1,208	.....
Hard Maple ( <i>Acer sacchar-</i> <i>inum</i> ).....	12	11—28	.....	.....	.....
Beech ( <i>Fagus ferruginea</i> ).	43	6—19	.....	.....	.....
White Ash ( <i>Fraxinus</i> <i>Americana</i> ).....	1	20—	.....	.....	.....
Totals .....	138	.....	39.46	7,220	4

NOTES.— This acre was selected in a primitive forest, growing on a "bench" or natural terrace, well watered, with a northerly exposure. The undergrowth, in addition to the nurallings of the dominant species, was composed largely of Mountain Maple (*Acer spicatum*), with occasional specimens of Striped Maple (*Acer Pennsylvanicum*). The growth under and near the hemlocks was completely covered in places with the American Yew or Ground Hemlock (*Taxus Canadensis*).

TABLE XVII.

ACRE No. 1.

Lot No. 206, Township 11, O. M. Tract, Essex County, N. Y.

SPECIES.	Trees.	Diameters in inches.	Standards.	Feet, B. M.	Cords.
Black Spruce ( <i>Picea nigra</i> ).	52	5—16	14.49	2,651	4
Hemlock ( <i>Tsuga Cana-</i> <i>densis</i> ).....	26	9—28	20.00	3,660	.....
Balsam ( <i>Abies balsamea</i> )..	44	7—16	9.00	1,647	.....
Yellow Birch ( <i>Betula lutea</i> )	37	6—20	.....	.....	.....
Hard Maple ( <i>Acer sacchar-</i> <i>inum</i> ).....	14	8—22	.....	.....	.....
Totals .....	173	.....	43.49	7,958	4

NOTES.— This lot (206, Township 11) was lumbered about 33 years ago by C. F. Norton, at which time the pine and spruce were cut; but the spruces under 10 inches in diameter were not taken. Since then—about 16 years ago—it was cut over again, at which time some white ash and yellow birch was taken, as well as the larger spruce.

This acre strip was measured off on level land, not low enough to be swampy, but a bench of table land. The crown covering is dense; and the timber, with the exception of the hemlock and some of the hardwoods, seems to be a second growth,—that is, it has been growing among first-growth trees, and has made a rapid progress after the interlucation made by cutting out the larger trees.

TABLE XVIII.

ACRE No. 2.

*Lot No. 206, Township 11, O. M. Tract, Essex County, N. Y.*

SPECIES.	Trees.	Diameters in inches.	Standards	Feet, B. M.	Cords.
Black Spruce ( <i>Picea nigra</i> ).	51	5—16	20.00	3,660	7
Hemlock ( <i>Tsuga Cana-</i> <i>densis</i> ).....	15	10—24	24.00	4,392	.....
Balsam ( <i>Abies balsamea</i> )..	38	7—16	10.00	1,830	....
Tamarack ( <i>Larix Ameri-</i> <i>cana</i> ).....	5	7—12	.....	.....	.....
Yellow Birch ( <i>Betula</i> <i>lutea</i> ).....	30	10—23	.....	.....	.....
Soft Maple ( <i>Acer dasycar-</i> <i>pum</i> ).....	14	8—20	.....	.....	.....
Totals .....	153	.....	54.00	9,882	7

NOTES.—This acre was measured off at the extreme end of a bench of table land extending toward a swamp. The undergrowth is mostly small yellow birches and mountain maples, the latter appearing only where the cutting had been severe, evidently places where the ground was originally cleared for skidways.

TABLE XIX.

ACRE No. 3.

*Lot 206, Township 11, O. M. Tract, Essex County, N. Y.*

SPECIES.	Trees.	Diameters in inches.	Standards	Feet, B. M.	Cords.
Black Spruce ( <i>Picea nigra</i> )	15	8—22	9.00	1,647	3
Balsam ( <i>Abies balsamea</i> )..	5	7—14	.....	.....	....
Hard Maple ( <i>Acer sacchari-</i> <i>num</i> ).....	30	9—28	.....	.....	.....
Beech ( <i>Fagus ferruginea</i> )	39	7—20	.....	.....	.....
Totals .....	89	.....	9 00	1,647	5

NOTES.—This acre was selected on a hardwood slope with a northerly exposure. Interspersed with the larger trees there was a large number of small yellow birches and maples, and in places, groups of small balsams, all under five inches in diameter. Only a few of the hardwood trees had been cut by the lumbermen.

The crown development was dense, and the forest in good condition.

TABLE XX.

ACRE No. 4.

Lot 206, Township 11, O. M. Tract, Essex County, N. Y.

SPECIES.	Trees.	Diameters in inches.	Standards.	Feet, B. M.	Cords.
Black Spruce ( <i>Picea nigra</i> ).	36	8-22	15	2,745	5
Hemlock ( <i>Tsuga Canadensis</i> ) .....	30	12-27	20	3,660	.....
Balsam ( <i>Abies balsamea</i> ) ..	10	6-12	.....	.....	.....
Yellow Birch ( <i>Betula lutea</i> )	27	7-24	.....	.....	.....
Beech ( <i>Fagus ferruginea</i> ) ..	40	8-20	.....	.....	.....
Black Cherry ( <i>Prunus serotina</i> ) .....	3	6-20	.....	.....	.....
Totals .....	146	.....	35	6,405	5

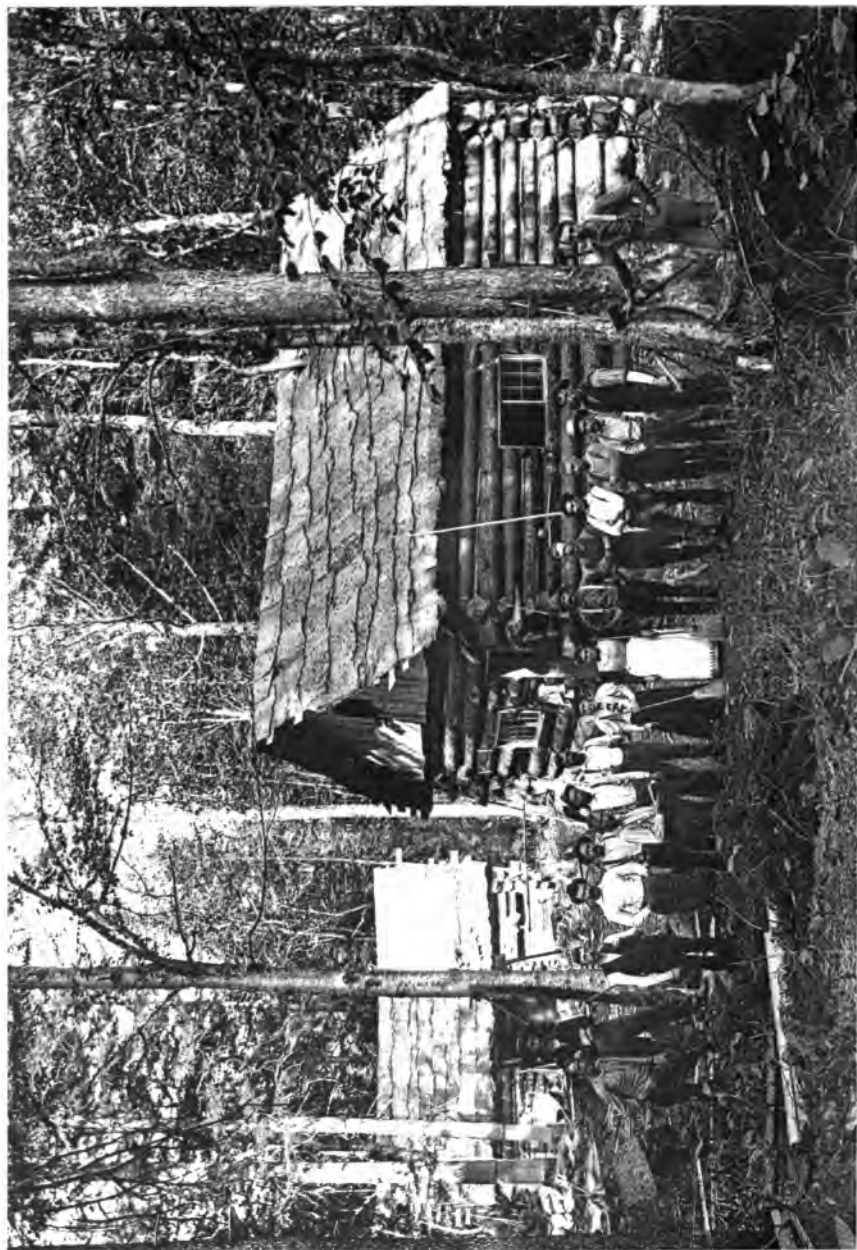
NOTES.—This acre is on land sloping toward the east. On this strip there is a cluster of spruces that have all the appearances of being a "first-growth," although the trees are not large. It is evident that at the time of the first cutting these trees were considered too small for saw logs.

In several instances the owners of spruce timber lands in northern New York have shown an encouraging and commendable tendency to manage their property with reference to sustained productivity. Instead of taking all the merchantable timber available for immediate profit, they have restricted their cutting materially with the intention of securing further growth and further revenues in future. The cutting of small spruces for pulpwood has been prohibited on many large tracts, although the revenue derivable from this source is large and available at any time. Furthermore, the cutting for lumber or saw-logs is restricted to trees 12 inches in diameter on the stump.

Although this is a step in the right direction, and something of an improvement on previous methods, there is little in it worthy of the name of forestry. As an approach to scientific or even intelligent forestry methods it is a very slight advance indeed.

It is true that spruce lands in our State have been cut over a second and even a third time, at intervals of 25 years or thereabout, and that such cuttings have proved remunerative. But this was not rendered possible altogether by any increase in the





G. H. Risson, Photo.

**LUMBER CAMP.**  
(Roof covered with spruce bark.)

rate of growth due to the interlucation resulting from a previous thinning of the trees; nor in any great degree to the natural increase in size during the intervals.

These successive crops of spruce were due for the most part to other reasons. In the first cutting only the larger and easily accessible trees were taken. Large trees were often left because it did not pay to cut roads to them, the roads being confined to the areas on which the timber grew thickly. In the second cutting roads were extended into these areas of scattered spruces, some slight increase in market price warranting this additional expense. The large trees left at the first cutting were then taken out, together with many others which had become large enough through this additional period of growth. The third cutting becomes feasible 25 years later by reason of increased market values, improved means of access, and the demand for pulpwood — the latter demand alone making it profitable in many instances to cut over an old tract where the sawing timber by itself would not yield enough to pay the expense of "lumbering" it. Of course, the younger spruces increase in size during the intervals between operations, and at each return the axeman finds some trees large enough for saw-logs which previously were too small. But too much stress has been laid on this factor in the question, while too many other and important points have been ignored.

Assuming that our spruce forests are to be managed, for a period at least, under the well-recognized and accepted forestry method known as that of "selection," we will waive the all-important question of cutting for improvement, and turn to that of cutting for revenue — for future and continuous revenue as some of our well-intentioned forest owners are pleased to term it.

This method, which for convenience may be termed cutting for revenue, can not secure the desired result — that of the perpetual maintenance of a merchantable species — unless the cutting is confined to mature trees only. Nothing short of this will answer. Now, it would be difficult to say just what diameter should be assumed in defining a matured spruce. This is evident from the figures in the preceding tables. Moreover, this diameter must vary in different localities. Such diameter can not be ascertained, if at all, until working plans covering a century of improvement cutting, seeding or planting have been exploited. It would be idle to discuss it here.



But if there is to be no improvement cutting, if our forest owners prefer to start with a fixed diameter as a basis for restriction in revenue cutting — “a rule of thumb,” as Dr. Fernow calls it — such diameter can be fixed approximately in each locality; and when thus determined, if it approximates closely the average diameter of the matured spruce, it may answer as a first step in a right direction. Such diameter need not be fixed at the maximum. On the contrary, something should be subtracted to offset what is termed in forestry the interest account. A perfectly managed forest is one that will produce the greatest possible revenue and maintain it. It is evident that as a tree approaches maturity there comes a time in its slowly waning growth after which the increment will not equal in value the interest on the money obtainable if cut at that time. Before felling a tree it is not necessary to wait for the signs of decay that announce the cessation of growth. The tree may be turned into money before that, and, in view of the interest account, thus yield a greater profit than to wait for its maximum development.

It would be impossible to name any diameters here which should govern such cutting. But any owner of spruce lands can arrive approximately at the proper size if the question is approached intelligently and honestly. Certainly, the twelve inch limit now in use falls far below such requirements. A tree sixteen inches in diameter yields twice as much lumber as one of twelve inches; and one twenty inches yields four times as much.

By harvesting matured trees only, the land owner receives the legitimate income from his property, and makes it a perpetual, interest-bearing investment; by harvesting the timber before it attains its growth, he decreases the future productivity of his land, and, for the sake of immediate returns, makes a heavy draft upon the principal. Moreover, if he confines his cutting for revenue to mature trees he not only preserves his principal intact, but by adding to his work some judicious improvement cutting he can increase the value of the principal and its corresponding productivity.

Many owners of spruce lands have been encouraged by the repeated crops attainable from cutting on a basis of ten or twelve inches in diameter on the stump to assume that such returns may be obtained perpetually. Even if this could be done the yield



## DRIVING LOGS.

(On Big Marsh Stream, W. of Piseco Lake.)

G. H. Rileon, Photo.



thus obtained must be inferior in quantity and value, like any crop that is gathered before it is ripe or has attained its full growth.

It is maintained by experienced foresters, and with good reason, that the persistent cutting of any one species, especially where it is done before the trees have attained their full size, tends to the deterioration and, ultimately, to the extinction of such species. This ought to be evident without going into the technical reasons.

It is not intended in this report to criticise unfavorably the land owners who are willing to accept pay for twelve-inch spruce. It is their property, and if they prefer the cash in hand to future payment they have the right to accept it without comment. In fact, many who advocate other methods would probably do the same if they were fortunate enough to own spruce timber lands. But the owners of woodlands who are able to hold them, and who may wish to manage their forest so that it will yield the greatest revenue, and are willing to waive immediate returns in favor of a permanent, revenue producing investment will do well to study this question carefully.

The felling of immature spruce merely for revenue should be discontinued. Mature trees, however, should be converted into money. Part of this money could be set aside with advantage as a fund from which to pay the expense of improvement cuttings, through which the growth of desirable species would be fostered and inferior ones eliminated. The work of the axeman should not be limited to the mature trees which are cut for revenue, but should include the removal of all diseased trees and inferior species, large and small, even though such timber does not yield one cent to pay for the work. Then, again, it might be necessary often to allow sound, mature trees to remain, because their removal might influence surrounding conditions so unfavorably as to inflict a loss greater than their value. But to go further into this subject would involve the recital of technical details of management which are foreign to the scope of this article.

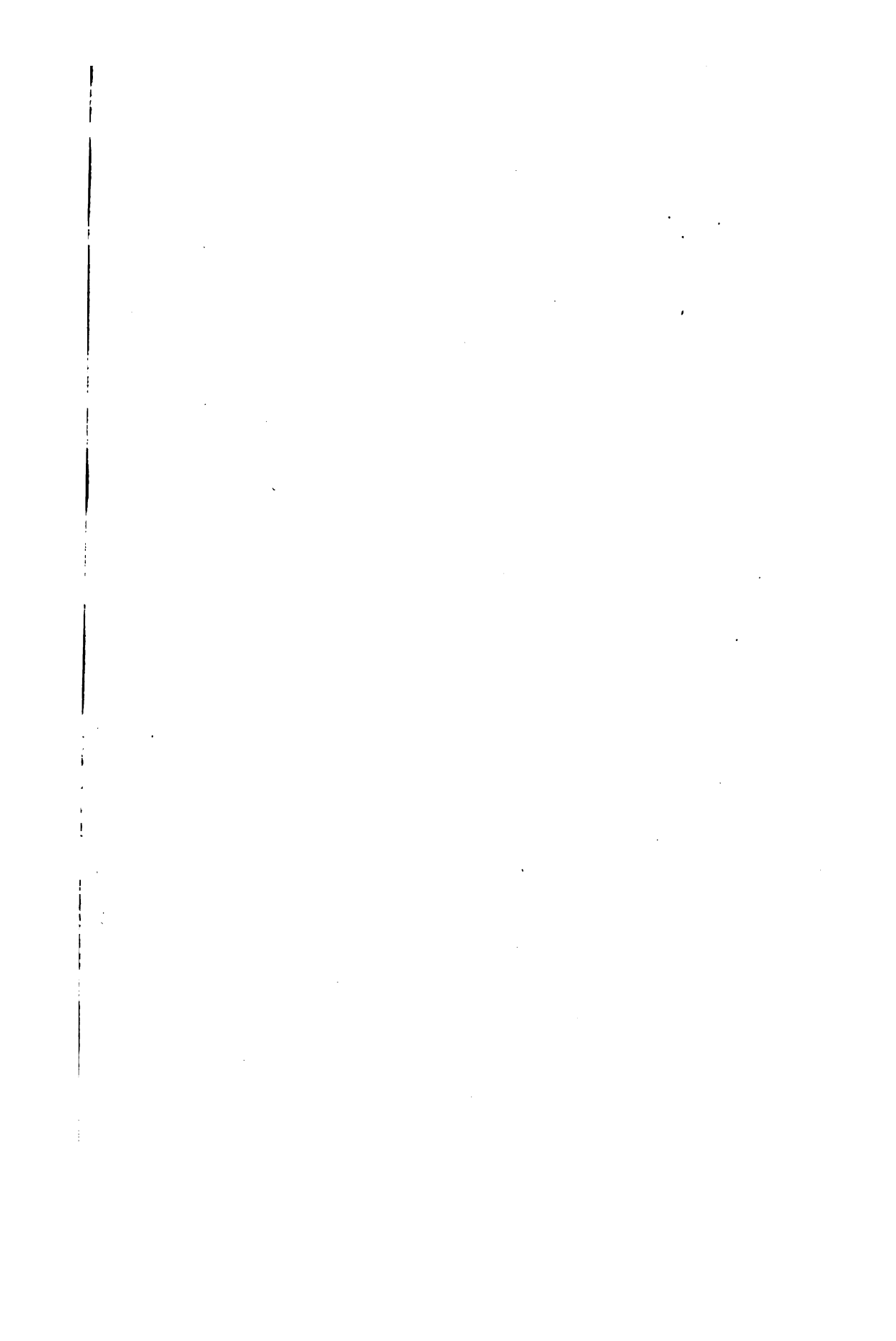
Some mention should be made here of the natural tendency of the Adirondack spruce to reproduce itself, a fortunate characteristic that, under the guidance of skillful foresters, could be utilized with great advantage in the work of forest improvement. But

land owners who persist in cutting down to a small diameter on the stump should not rely on this natural seeding of the spruce to correct their faulty system. In the dissemination of spruce seed and starting of natural plantations, nature has proved whimsical and while the young spruces generally succeed the poplars and bird cherries on the burned lands, they often fail to restock the lands of their own habitat which have been rendered bare by injudicious cutting.

The thrifty landowner who would manage his spruce lands rightly should not only confine his cutting to sound methods, but should employ a skillful forester whose judicious, fostering care of the seedlings, together with some provision for the dissemination of seed, will insure that future stability of income which is the main object and aim of intelligent, scientific forestry.

The foregoing paragraphs have dealt solely with the question of the black spruce, because the other merchantable species in the Adirondack forests growing in company with it are seldom accessible. The white pine, except in few localities, was removed years ago. The hemlock is valuable mainly on account of its bark, and in many townships is not cut at all. The hardwoods, though merchantable near the borders of the forest, owing to their accessibility, are not marketable for the most part, as the logs can not be floated down the streams.

Still, the roads and railways which are penetrating the forest in increased numbers are fast rendering the hardwoods accessible. The time is near when most of the broad-leaved trees in the Adirondacks, as well as the conifers, will become merchantable species. The same provisions which should regulate the cutting of the spruce will apply to them also. The value and productivity of these timber lands will be correspondingly increased, and with the proper management of our woodlands American forestry will occupy its rightful place as a beneficent factor in our political economy.



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